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Technological Drive from Past to Future?

50 Years of ICOHTEC

The 45th ICOHTEC Symposium

17 – 21 July 2018, Jean Monnet University

Saint-Étienne, France

The Book of Abstracts

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Preface

It is a great pleasure to provide this Book of Abstracts (BoA) to the participants of the 45th ICOHTEC Symposium. With the Programme Booklet, it provides a glance on the contents and structure of this meeting as well as description what themes the global history of technology is studying at the moment. The most conspicuous observation is the enormous variety of research topics and the versatility of approaches. Some themes of sessions are traditional and some brand new while some have returned in the programme of our symposium with new updated viewpoints and new data. Another striking feature is the great geographical scope and the widespread involvement of new researchers. This is probably the most international ICOHTEC symposium during the 50-year history of our organisation.

In this volume, abstracts are organized according to the sessions where they are held. Sessions, in turn, are in chronological order. Consequently, the schedule of sessions in the Programme Booklet and this BoA are supporting each other, while abstracts of each session can be found close to each other.

We hope that you enjoy our Saint-Étienne symposium, learn new exciting things and meet interesting people during the five-day convention. It would be great to meet you again in the following ICOHTEC symposia and summer schools.

*On behalf of the ICOHTEC's Programme Committee and the Local Organising Committee,
Jean Monnet University, Saint Étienne.*

*Timo Myllyntaus
ICOHTEC*

*Robert Belot
Local Organising Committee*

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Wednesday, 18 July

09:00—10:30

WIA Railways in the Making of Modern Societies I

Location: H 13

Organiser: Timo Myllyntaus

Chair: Timo Myllyntaus

The Carrying Trade and the First Main-line Railways in England, 1840-1850

Ms. Carolyn Dougherty

Transport history, and the history of industrial development in England, generally consider the change from moving goods principally on roads, inland waterways and coastal shipping to moving them principally on railways as inevitable and unproblematic, and resulting from an improvement in technology. While the higher speeds and lower costs of railway passenger travel were so clear that competition from railways eliminated most passenger road transport almost immediately, railways did not have as much to offer the well-established goods transport sector; the conflict between the carrying trade and the railway companies, known at the time as the carrying question, lasted at least two decades.

I will begin this paper with a brief description of the carrying trade before the railways, and its relation to the economy within which it operated. I will then describe how the first main-line railway companies connecting city pairs came to dominate goods transport between about 1840 and about 1850, despite resistance from not only the carrying trade but also its customers, the government and the general public. Evidence of the mostly forgotten conflict, between two ways of doing business, comes from contemporary correspondence, newspapers, journals, pamphlets, and ephemera, railway company records, records of legal cases and Parliamentary Select Committee hearings, and such quantitative information as listings in business directories and census data.

This paper addresses the conference subtopic, ‘expressions of “technological momentum” in history’, in two ways—first, in my reshaping of the technological change from the carrying trade to railway goods carrying as a historically contingent process rather than an unproblematic technological improvement, and second, in my argument that this change in transport mode, generally considered a

technological issue, was in fact a change in business management and economic relationships rather than simply the substitution of one technology for another.

The Coming of the Mail and the News: Railways and Cultural Change in Rural Great Britain, 1840-1914

Professor Robert M. Schwartz

In Victorian Britain, the interplay of railways, telegraphy, the Post Office, and newspapers created a modernized and much expanded information network. How and when did Victorians of different classes and localities variously participate in the network? To what extent did that participation variously change everyday experience and perceptions of events at a distance?

*The first of these research questions concerns **access** to new information. This part of the story is discovered with historical GIS: the use of spatial and temporal analysis of geo-referenced data to map the varied and changing geography of rail transport, postal service, and newspaper circulation. By the 1880s, the modernizing information network, heretofore monopolized by London and major provincial cities, was extended into hinterlands and remote areas as railways penetrated into the countryside, bringing postal service and newspapers in tow. In addition to mapping new rail lines and stations, the annual reports of the Post Office to Parliament reveal change both in geographic coverage and in the items sent by parcel service.*

*This leads to the second question on **the use** of new information. To move beyond the privilege scale of communication of the upper classes in London and other provincial cities, I use evidence on parcels and adverts in local newspapers to tease out patterns of change in rural regions and localities. When, for example, could a farmer order seeds by mail; when could the farmer's wife order fabric, clothing, or shoes from a town? Although the mental and emotional worlds of the farmer and wife remain—as for most Victorians—all but closed for lack of evidence, identifying patterns of **access** and **use** of modernized information will make a significant contribution to the effects of technology in Great Britain.*

Portuguese Metropolitan and Overseas Railways and Harbours as Portals of Globalization, 1850s – 1910s

Researcher Hugo Silveira Pereira

In the 1850s onwards, Portugal started a broad public works programme, influenced by the saint-simonianist promises of progress and creation of civilizations of circulation that Portuguese engineers contacted since the 1820s. From the late 1870s onwards, that programme was also applied to the Portuguese overseas possessions of Africa and Asia.

Until the eve of World War I, thousands of miles of railway track were laid across these territories. Most of the lines (especially in the colonial context) ended in ports, which were also improved or built from scratch. The goal sought by the Portuguese technocrats with this investment was to develop the colonies output and to increase foreign trade, but at the same time enhance a technologically-based nationalism and ascertain the Portuguese sovereignty in the overseas domains, coveted at the time by other, more powerful, European nations.

In this paper, I propose to analyse this contradictory rhetoric and these infrastructures (both in the mainland and in the overseas) as portals of globalization, understood as “those places that have been centres of world trade or global communication, have served as entrance points for cultural transfer, and where institutions and practices for dealing with global connectedness have been developed” – according with the definition of Middel and Naumann. I will focus on two decisive moments of this historical process, construction and operation, and analyse to what extent globalization (of trade, of know-how, of ideas) was fostered or restrained.

Railways as Tools of Direct and Indirect Empires in Africa: Angola and Mozambique

Professor Bruno J. Navarro

The Berlin Conference (1884-85) consecrated a new colonial order that fitted perfectly the imperial agendas of Britain, Belgium, France and Germany. As “informal imperialism” based on historical rights gave place to the policy of effective occupation of African territories, the rivalries among European colonizing powers became increasingly critical. Portugal responded to this new international framework by launching a set of “civilizing outposts,” to secure the Portuguese sovereignty over the hinterland of both Angola and Mozambique.

The corner piece of the Portuguese strategy was not different from the British, the French or the German ones. As all colonial agendas, the Portuguese one was designed to secure the exploitation of the colonies, imposing a European worldview that implied altering the physical, social and economic structure of the colonized territory under the label of the “civilizing mission.” Railways, roads, harbors, dams designed by engineers transformed both the African landscape per se, by molding it to the needs of building the railway lines and its use, by carving the way to plantations, mining, and trade outposts in the land formerly used by indigenous as pastures or hunting territories and by establishing white settlements.

The paper proposes to discuss the strategies deployed by Portugal, a peripheral country in Europe, to use its African Empire as a token for asserting its position in the European arena. Beyond diplomatic and political demarches, technology - and particularly the building of railways - was at the core of the Portuguese imperial agenda, determining the way African territories were immersed in the global

market. Engineers played a central role in this process by discussing and eventually deciding the layout of the railway lines and thus establishing an economic hierarchy among geographical spaces not only within colonies, but also in a worldwide context. I will use two case studies, one in Angola and one in Mozambique, to argue that technological choices in the colonies were strongly pervaded by political and economic European agendas.

WIB The Dream of Flight in the Popular Imagination

Location: H 21

Organiser: Tom Crouch

Chair: Peter Jakab

"Like all novices, we began with the helicopter: "An Ancient Toy That Inspired the Air Age

Dr. Tom Crouch

*"Certainly the part played by toys...in fostering important inventions cannot be ignored," Lewis Mumford remarked in his classic, *Technics and Civilization*. "The helicopter," he continued, "was invented as a toy in 1796." In fact, Joseph Needham traced the history of this most ancient flying toy to China in the 4th century BCE. The little rotary wing device appears in Medieval and early modern works of art, although French specialists argue that it was a noisemaker rather than a helicopter. In any case, European artists from the thirteenth to the sixteenth centuries portrayed this and other aerodynamic toys in portraits of children and images of children at play. Eighteenth century experimenters introduced a redesigned helicopter toy powered by a tension bow. The English baronet Sir George Cayley produced his own version of the helicopter, which launched his career as a pioneering aeronautical engineer. Throughout the nineteenth century, variations of the rotary wing toy inspired several generations of enthusiasts, down to and including the brothers Wilbur and Orville Wright. If the flying toy inspired the inventors of the airplane, however, it sent other aeronautical dreamers in Europe and America scurrying down a blind alley, attempting to achieve heavier-than-air flight with a rotary wing machine. Vertical flight would remain an elusive technical goal until well into the 20th century. This paper will consider the evolution and impact of the little helicopter, with observations on other aerodynamic toys. Sources will range from eighteenth and nineteenth century journals and the papers of Sir George Cayley and the Wright brothers to the scholarship of authorities like Needham, Clive Hart and C.H. Gibbs-Smith, as well as articles in French and English magazines and journals.*

Imaging Faster-Than-Light Travel and Fictional Spaceship Designs
 Dr. Margaret Weitekamp

*Although fantastical trips to space had been imagined for centuries, French science fiction author Jules Verne's *De la terre à la lune* (From the Earth to the Moon) offered one of the first visions of a conceivable voyage to the Earth's nearest neighbor. This paper examines how ideas about imagined space travel evolved over time in ways both grounded in practicality and playful in imagination. In doing so, this paper builds on historian Frank Winter's argument that American inventor Robert Goddard's liquid-fuel rocket experiments in the 1920s inspired worldwide science fiction to coalesce around rockets as the means for space travel. Using sources that include newspaper coverage, archival research, films and television, as well as physical objects, this paper argues that after the world public witnessed real human spaceflights in the early 1960s, fictional depictions of space travel included different forms of faster-than-light travel. Beginning with literary descriptions of generation ships, this paper examines faster-than-light drives, hyper drives, jump drives, and worm holes. In roughly chronological order, these concepts constitute a revolution in the visual imagining by creative people of how to solve the technological problems presented by time and distance in space.*

Fascinating Toys: Flying Cars Are Dead but They Will always Be Fun

Researcher Dorothy Cochrane

Mark my words, a combination airplane and motorcar is coming. You may smile, but it will come. Henry Ford, 1940

*Make no mistake, flying cars are real, and the fascination with flying cars is real, but they are not going to be a successful form of aerial personal or urban transportation. So what? Perhaps we should stop pretending and just enjoy, and market, them as they are. The 1890 Au Bon March store's line of futuristic ads with an image of a gentleman flying a car with wings over Paris is an early example of the dream and joy of a flying car. Following the invention of the airplane, the desire to build simple and easy to fly models became known as the flivver movement, and out of it came the first flying car to actually take flight, the Waterman Arrowplane. But the flivver movement found its success much later in the sport aviation category of homebuilts and ultralights, rather than flying cars. While the Fulton Airphibian and Taylor Aerocar became the most "successful" 20th century flying cars, neither found a commercial market. *Popular Science* and *Popular Mechanics* magazines never gave up on the subject and annually touted the next design of dreamers and inventories. Each design was most certainly the way of the future. But each design was condemned to failure because of the inherent difficulties of combining an airplane and a car. The quest continues unabated in the 21st century with the Terrafugia Transition among others but the result is the same. This paper will consider the dreams and failures*

of flying car designs, and marketing, and suggest that emerging technology has already left the flying car for dead as a relevant form of transportation. Instead, citing existing and proposed designs, can we adjust the concept of flying cars and just play with this technology?

WIC Encounters of New War Machines and Fictional Armored Shields

Location: HR 5

Organiser: PC

Chair: Norman Aselmeyer

Development and Evolution of Seaplanes in Europe during World War One

Ph.D. candidate Marion Weckerle

The first experimental seaplane flights took place in 1910, respectively in France by Henri Fabre and in the United States by Glenn Curtiss. Following these experiments, the main European powers showed immediate interest for the marine qualities of these machines, since the competition within the aeronautics industry was of ideological importance. Thus, we propose to examine the role played by seaplanes during World War One, which is understudied in comparison to land aviation, because of the symbolic significance of the latter, whereas seaplanes operations were less mythologized.

This type of research requires to examine different types of sources. Therefore, we use for this study an open corpus, part of which is nowadays available online. Online available printed sources are mostly journalistic material, iconography, but also patents. One of the main challenges to study this technological production is the lack of surviving seaplanes as well as of company archives. However, alongside the archives held by the Historical Defence Service and a few seaplane pilots journals, we were able to locate at the Seaplane Museum in Biscarrosse, the archival fund of Henri Fabre, inventor of the seaplane but also an engineer active in this industry during World War One, and to study his fund, which has never been done before.

It appears from the research that a military use of seaplanes was actually considered by France, Germany, the United Kingdom and Austria-Hungary, before World War One, as a corp with its own specificities and missions, and technological questions that could not be resolved by just copying land planes, like tests of seaplane-carriers. Therefore, studying the seaplanes brings up a better

understanding of the operations led at sea (North Sea, Adriatic and the Mediterranean sea), of the aircraft technology developed during the conflict, its industrial production and exploitation, and post-war consequences.

Nothing at Risk?: Experiencing World War I in VR

Dr. David Howell

During the centenary commemorations of World War I, cultural institutions went to great lengths to develop and present interpretative materials, many of which focused on immersive experiences. This surge in interpretive responses to the centenary, coincided with a boom in the profile and popularity of VR. Virtual reality platforms have provided developers and, in turn, cultural institutions, with an incredibly versatile and immersive resource. While museums and related organisations have perhaps been slow to explore such technologies, VR responses to World War I more generally, are now numerous, offering users the opportunity to ‘experience life in the trenches first hand’ and to ‘relive the suffering’ of trench warfare.

While immersive experiences have clear educational benefits, have the ethical implications of such platforms been given the level of attention they deserve? There are clear questions over both the capacity of VR to allow users to gain any real sense of ‘suffering’, but also whether or not it is appropriate to attempt to create experiences of this nature. While there is a similar debate explored frequently in relation to computer gaming and battlefield-based entertainment, the educational merits on which VR platforms are presented, makes the medium distinct, and the question of particular importance.

This paper will consider the ethical implications of ‘placing’ users in a battlefield context, explore the role of historical accuracy in VR World War I themed output, and question the educational capacity and merits of such products.

Lionization, Professionalization, and Mechanization: Three Contrasting Visions of Powered Armor in Speculative Fiction

Ph.D. candidate Ian Boley

Powered armor is a technology seen throughout speculative fiction milieus and—unlike concepts such as faster-than-light travel—is practically possible, albeit still in development. While some research has been done into the history of real-world powered exoskeletons, the differences in fictional powered armor across various times is still underexplored, and offers a unique glimpse into perceptions of conflict in those eras. These different conceptions are tied both to a given author’s personal background and to prevailing cultural attitudes toward warfare, resulting in a social construction of powered armor and its uses. This paper examines the use of powered armor in three major fictional works, situates them in the relevant

historiography examining their respective timeframes, and explores their relationship to concepts of technology in conflict then prevalent. In E.E. “Doc” Smith’s Lensman series, powered armor serves to enable feats of derring-do in line with notions of futuristic combat inspired by romanticized First World War aviation. Robert Heinlein’s post-Korean War Starship Troopers presents a professional military with utopian levels of morale and expertise fighting an intelligent and implacable enemy utilizing “human” wave assaults inspired by the popular conception of Chinese forces. Finally, Joe Haldeman’s The Forever War shows the dehumanizing effect of powered armor in a situation where the soldiers are disillusioned by their struggle, as in orthodox representations of the Vietnam War. In each case, the design of the powered armor technology and its capabilities reflects the author’s conception of what warfare is like, and shows the influence of the time on the social construction of fictional technologies. In terms of the conference sub-themes, this paper examines the future uses of technology in speculative fiction and utilizes one possible approach to contextualize a single technology’s use in fiction alongside established literature on memories of conflict.

WiD Electricity in Cultural and Political Development

Location: H 26

Organiser: PC

Chair: Alex Lesanu

Electricity in the Making of Post-colonial Spain, 1880-1936

Dr. Daniel Pérez Zapico

*This paper analyses the controversies that Spain’s electrification set in motion in a context of recent loss of an Empire. 1898 is the year of the “Disaster”, that is the loss of the last remnants of a once large overseas empire. The identity crisis that followed epitomized the long decay of Spain, in a context of failed industrialisation and a contested nation-building process with an increasingly fragmented society. What was the role of electrification? This talk analyses how different social and political actors attributed to electrification a variety of social meanings dealing with the issue of Spain’s modernisation and the reconstruction of national identity. Thus, the central state, *Regenerationist* thinkers, the political groups close to power, technocrats and industrialists attributed to electrification the capacity of restoring Spanish splendour. Nevertheless, a broad cluster of marginalized left-wing groups saw in electricity a force for social or even revolutionary transformations. Other sectors, in contrast, developed an openly hostile position: in 1903 the Spanish Catholic Church forbade electric light in its temples.*

This presentation, is set in the wider framework of a post-doctoral fellowship that will be held at the Centre for the History and Philosophy of Science (University of Leeds) from April 2018 onwards. Through a corpus of varied sources -mainly

journals, periodical publications and literary sources- and a methodology based on the socio-cultural approach to the history and sociology of electrification this talk aims to discuss with wider experts and scholars to what extent different social, political and even religious groups - each with competing interests and agendas- shaped the course of national electrification.

Politics of Urban Electricity Grid in Ottoman Istanbul during the World War I

Ph.D. candidate Duygu Aysal Cin

This paper focuses on the politics over production and consumption of electricity in Ottoman Istanbul during the World War I. The paper will analyse the consumer relations, the role played by the Ottoman State as the organizer of the electrification works by its regulations and the actions taken by the European consortium through the research done in the National Archives of Turkey, Princeton University (USA) Libraries and Rare Books Department, and Deutsche Bank Archives in Frankfurt.

Istanbul is the first city in which an electric plant was established in the Ottoman Empire. The concession agreement for the first electrical plant (Silahtarağa) was realized in 1910. Building of the plant took four years and the factory was opened in 1914. Since then, the city was provided with electricity.

In the first place, this paper sheds a light on the consumer relations around electricity between the consumer, company, and Ottoman administration. No doubt, consumption of electricity as a commercial product regulated by the subscription contract signed by the consumer and the company, designated a new consumption practice for the Ottoman society.

However, the study argues that the conditions of war generated more complicated practice for its production and consumption ranging from consumer behaviours to different instruments of electricity market and working conditions in the plant.

Beyond the new type of consumer for urban electricity grid, the War created inflationist economic environment in which the prices of coal and copper (two vital elements of electricity production) increased enormously. The higher costs regarding electricity production affected electricity market. On the one hand, the consortium which acquired the electrification concession of Istanbul, requested revision on the prices of electricity. On the other hand, Ottoman bureaucrats acted on the consumer side while arguing that people already bore the heavy burden of war conditions. Additionally, Ottoman administration demanded the application of the concession agreement as it was signed before World War I. As a remedy for higher costs of electricity production, the consortium employed instruments of liberal electricity markets such as dual agreements, which were just realized in contemporary Turkey of the 21st century. Apart from the prices of electricity, the workers in the plant made a wage claim since the salaries they received could not

compete with the inflation rates. This resulted in an unrest with the workers and plant administration which then resulted in agreement between both sides.

The Heritage of the „Networks of Power“. Reading Monuments as Sources of the History of Technology

Dr. Michael Hascher

The high-voltage transmission line from Brauweiler near Cologne to Bürs near Bludenz in Austria was built in 1924-1930 and connected the power stations in the Rhenanian lignite district with the hydroelectric power stations with big reservoirs in the Alps. It was one of the first steps to the synchronous electrical grid of Continental Europe, allowing to use lignite power stations for providing the base load and stored water for serving the peak demand. Until today, this line is in operation, mainly using the power poles from the 1920's. Therefore, in Baden-Wuerttemberg the line was listed as a historical monument in 2012. In the context of the "Energiewende", most of the poles will be destroyed for building new poles for a line using 380 kV instead of the former 220 kV. A small section will be preserved as a historical monument.

The paper examines the question, how to communicate the historical relevance of this fragment to the public. This is connected with the question, how we can read material sources, in this case historical monuments, as sources of the history of technology. The transmission line is well known among historians of technology, because it is mentioned in Thomas Hughes' famous book "Networks of Power" (1983). For others, one must find aspects beyond the mere associative function of an object that is supposed to be preserved. The thesis is that we can find these aspects in a combination of materiality, form and context of the cultural (industrial) landscape.

Hydroelectric Projections. The Culture of Water Power in the 1950s European Industrial Films

Ph.D. candidate Fabian Zimmer

*In the 1950s, hundreds of films about the ongoing construction and use of large dams and hydroelectric plants were produced all over Europe. In a remarkable collaboration between technological and aesthetic actors, between engineers and filmmakers, these films became both documents and *mises-en-scène* of the profound landscape changes occurring in this decade, which stands out as a central turning point in the recent debates about the anthropogenic Great Acceleration.*

*In my paper, I suggest that these films, that have not been studied by historians so far, offer new perspectives for the history of technology in two ways: On the one hand, these films were *utility films* produced in order to serve specific rhetorical aims, generally in order to appease the gradually arising anxiety over industrial encroachments on nature and landscape. Thus, their full meaning can only be reconstructed by an analysis of the discursive contexts from which they originated. They need to be examined not as mere representations of technology but as agents in the construction of public imaginaries about technology, nature and society. In looking at the use of these films, we also need to examine their audiences and the public sphere that they aimed to create. On the other hand, these films offer a specifically *visual perspective* on the public imaginaries of large-scale infrastructures and landscape change. They are prime examples of a visual culture of technology, in which the aesthetics of technological landscapes shaped utopian and dystopian narratives. But moreover, these visuals are complex and rarely without ambiguity; they cut across the dichotomy of progress and decline. In a close reading of selected film examples from the 1950s, my paper examines recurring narratives and allegories that structure these films, and that, I argue, display an early public ambivalence towards the emerging 'Age of Man'.*

WtE Technological Mindset in Political Activism and Miracles in Cookery

Location: E IIA

Organiser: PC

Chair: Marly Kamioji

The Fullness of Containment: Investigations in the Diverse Global Social Formations Shaping World Opinion and Otherwise Confronting the Political Might of Nuclear Weapons Technology

Dr. Julie Boddy

Just seven weeks after signing the United Nations charter the United States unilaterally and without warning dropped atomic bombs on the civilian

populations of Hiroshima and Nagasaki. The catastrophic destruction had the additional effect of decisively establishing the United States as the dominant military power in the world, while casting doubt on the international authority of the new organization that it had sponsored so recently. A predominately grass roots authority moved into the breach. It too had global dimensions. Representatives of racially oppressed peoples and peace and justice organizations, which had mobilized during the First World War and its aftermath, developed an antinuclear focus. The Non-Aligned Movement of recently colonized peoples featured nuclear disarmament on the platform at its first conference at Bandung, Indonesia in 1955. Subsequently the Movement moved to New York to hold its meetings alongside the UN.

In 1961 Ghanian President, Kwami Nkrumah, together with African American activists, organized the World without the Bomb conference in Ghana. Concurrent developments included the Rapaki Plan for the Demilitarization of Central Europe and the Costa Rican proposal to the Organization of American States for a Latin American nuclear arms control measure to prevent the manufacture of nuclear arms or their acquisition from the nuclear weapon states, in effect a nuclear-free zone.

This paper aims to highlight aspects of the broad global agency of the movement for the abolition of nuclear weapons with the aim of enabling further acknowledgement of the vast popular will and its strategies which have so far kept the world from the full development of nuclear weapons technology into nuclear war.

Sources

Boddy, Julie, "Nuclear Weapons, Abolition of" in Paul Joseph, Sage Encyclopedia of War: Social Science Considerations. Rutgers: Sage, 2017.

Kitchen Technology: a Biography of the Couscous Pot

Dr. Sylvie Durmelat

The acquisition of new tastes requires the development of technological innovations as well as the intervention of specific social groups, writes Martin Bruegel. Kitchen technology, far from a neutral field, is indeed a product of history. As such, culinary techniques and cooking utensils literally shape tastes, and in the process, contribute to creating and maintaining cultural values as well as social and racial hierarchies. Couscous, a North African staple known in France since the Renaissance, entered the French dictionary following the conquest of Algeria, and became a favorite dish of the French only after the Algerian War of Independence and the "repatriation" of European settlers (1962). Making couscous French required the appropriation and transformation of original culinary techniques, namely the hand-rolling of semolina into tiny pasta that are then steamed in a couscous pot, via the development of new industrial tools and

*methods of preparation. I propose to study how the couscous pot changed during the colonial and post-colonial period, how these changes helped popularize the dish, as well as how industrial preparations eventually eliminated cooking by steaming, and the implications of such an elimination. Examining colonial administrative records, recipe books, and industrial brochures, this paper traces the industrialization of an indigenous North African food technology and how the colonized fed the colonizers not only food but *savoir faire*.*

WIF Energy and the Environment: Conflict or Compatibility

Location: E IIB

Organiser: Anthony N Stranges

Chair: Anthony N Stranges

How Wind Energy Contributes to the Reduction of CO₂ Emissions

Dr. Anthony N Stranges

This paper examines the contribution wind energy makes in reducing CO₂ emissions resulting from the combustion of fossil fuels. Scientists overwhelmingly believe that the combustion of fossil fuels produced most of the warming and that alternative energy sources such as wind energy will slow the warming.

The United States has remained one of the twenty-first century's global leaders in wind energy production despite strong competition from China. In 2015, US wind energy production more than tripled in just six years; and in 2016 wind-generated electricity prevented the addition of 159 million metric tons of CO₂ into the atmosphere, thereby reducing fossil fuel produced CO₂ emissions by 9 percent, the tonnage equivalent of 33.7 million automobiles' emissions. Globally, wind energy reduced CO₂ emissions by 637 million metric tons. The United States in 2016-17 has under construction 10,432 MW of wind-generated electricity, which when operational would remove annually another 124.2 million metric tons of CO₂, or about 1 percent of fossil fuel produced CO₂ emissions. Every megawatt-hour of wind-generated energy eliminates 0.70 metric tons of CO₂, each new 2-6 MW wind turbine will prevent 4,300 metric tons of CO₂ emissions annually, the equivalent of CO₂ emissions from 900 automobiles.

Wind energy has reduced sulfur dioxide SO₂ and nitrogen oxides NO and NO₂ emissions resulting from the combustion of fossil fuels. These gases cause acid rain, smog, and respiratory illnesses. The EPA's AVERT (Avoided Emissions and Generation Tool) showed that wind-generated electricity in 2016 prevented 178,000 metric tons SO₂ and 110,000 metric tons NO and NO₂ emissions. Using AVERT'S emission results, the Harvard School of Public Health concluded that reducing SO₂ emissions avoided \$5.5 billion in health costs, NO and NO₂ reductions avoided \$1.1 billion, giving a \$7.4 billion health costs saving.

The Atmosphere as a Commons – a Way to View Climate Change

Researcher Petter Wulff

In 1968 Garrett Hardin presented a theory of the environment, which he named "the tragedy of the commons". It stated that private interests would prevail over collective interests, whenever there was a conflict between them. Any jointly owned or used environmental resource would therefore tend to be overexploited and depleted. Two decades later Elinor Ostrom, using Hardin's theory as a starting-point, found that it was not universally valid. Indeed, there were quite a number of cases, where the members of a commons proved that they could put the collective and long-term interest before their own.

Hardin and Ostrom represent two different ways to see how a risk of overexploitation can be handled. Hardin's conclusion was that a commons needed initiatives from a higher authority to avoid tragedy. Ostrom, on the other hand, relied much more on local involvement and a bottom-up approach.

The atmosphere may be the most extensive of all the commons of mankind. Even before Ostrom's work it was recognized as a commons with an overexploitation problem, which has resulted in the climate change predicament of today. My presentation will reflect on how the conclusions reached by Hardin and Ostrom could be applied to the climate change problem, and why so little seems to have been done along those lines.

Energy Trilemma: Past and Future

Dr. Elena Helerea

The end of the 20th century was the period of technological propulsion and beginning of the intensifying danger of destroying ecologic equilibrium. The accumulation of goods and services did not achieve well-being, and led to different models for socio-economic development. The new concept of sustainable development appeared in the Brundland Report "Our Common Future" (1987, World Commission on Environment and Development), and accepted in 1992 at the Conference of the United Nations with respect to Environment and Development (Rio de Janeiro).

Implementation of this concept, which underlined that humanity has to pass to a sustainable environmental existence, began in the energy sector. The successful transition to an environmentally sustainable energy system included photovoltaic systems, decentralized energy generation, retrofits of existing buildings, adoption of low-carbon technologies, and electric vehicles to service mobility needs.

The World Energy Council proposed an efficient assessment tool of implementing the energy sustainability based on three factors: energy security, energy equity, and environmental sustainability. Balancing these three goals constitutes an

energy trilemma (Energy Building Code World Energy Council's case study, 2016, ECOTECH).

The paper analyzes the global evolution of the 2017 energy trilemma indexes with a case study of Romania's progress and efforts in ensuring a balanced energy trilemma and comparison with the results of other European countries.

Romania's scores well, with energy security strong at 7th globally and has already reached and exceeded its EU-mandated target of a 24% share of renewables (water, wind and solar energy) in gross energy consumption. Renewable energy's future is uncertain due to recent changes to the country's green certificate scheme and feed-in tariff system for small renewable energy producers, adopted in 2015.

Energy policy should focus on maintaining and improving the existing energy supply and transmission structure, which will need large investments to raise Romania's energy equity score.

Wednesday, 11:00—12:30

W2A Digital Uses and Tools for Historical Knowledge Management

Location: H 21

Organiser: Florent Laroche

Chairs: Michel Cotte and Florent Laroche

Synthesis on 3D Modeling and Simulation Applied to the History of Technology

Professor & Director Alain Michel

In the fields of heritage and historical interpretation of technological sites, nobody's afraid of modelization and 3D modeling any more. But behind our familiarity with the term, most of us are still doubtful about its purpose and puzzled about its use.

The word “model” is polysemic. It refers to different practices and meets contrasted application. One thing is sure: the production of “models” is nothing new. Since the Renaissance at least, models have been used to represent buildings, to display objects, to set the scene of machines, to synthesize processes, etc.

My point is that our perplexity is directly related to this diversity of realities designated as such. This multiplicity makes it difficult to distinguish between the various types of models, whether “real” or “virtual”, nay “3D models” now in vogue in the field of heritage objects and historical processes. Our confusion is also related to interdisciplinary openings necessary for the development of digital and numerical tools and popularization for the popularization of scientific results.

The communication proposes a state of the art on the subject of 3D modeling linked to historical research. It will also the outline of a methodological and epistemological reflection about available digital tools for 3D modeling.

Comparative History of Industrial Cultural Landscapes: The Question of Knowledge Modelling (Semantic Web and Virtual Reality)

Director Sylvain Laubé, Ph.D. Candidate Bruno Rohou, Ph.D. Candidate Marie Abiven, Prof., Director Ronan Querrec and Prof., Director Serge Garlatti

As part of the french Research Group named PAM 3D Lab (Patrimoine/ Heritage, Artefacts, Mediation and 3D), we developed a new research method in the field of digital humanities (semantic web and Virtual Reality) concerning the comparative history of industrial cultural landscapes. The issues are to develop and to validate innovative methodologies for:

- 1) conservation, safeguarding of the industrial heritage including human activities and associated knowledge;*
- 2) data collecting and sharing, notably in the framework of participatory science, as well as cultural mediation.*

This methodology is based on meta-models of three types: a meta-model of activity in history (ANY-ARTEFACT), a ontology called ANY-ARTEFACT-O (as a CIDOC-CRM extension) which is built from two types of landscapes industrial cultural: port (Brest, Venice, Mar del Plata, Rosario) and mining (Atacama) and a computing metamodel MASCARET. This methodology is part of the creation of Intelligent Virtual Environments (IVE) in an interdisciplinary approach (archaeology, anthropology, history and computer science).

We propose to explain in our presentation the different elements of this method as well as the implications for the development of an Intelligent Virtual Environment (IVE) for the preventive conservation of industrial heritage.

Prepared in co-operation with the research project: "Histoire Culturelle des Sciences et des Techniques, Humanités Numériques et Médiations", Université de Bretagne Occidentale, France.

Ethnographic Field Methods, Digital Technologies and the Interpretation of Heritage

Prof. Laurier Turgeon

This paper aims to show how ethnographic field methods and digital technologies can be used to elaborate new approaches and practices for the interpretation of heritage, both tangible and intangible. If ethnographic field methods and digital technologies have been used until now primarily to carry out research on scholarly subjects, they can also be mobilized to interpret and disseminate heritage. Observations and interviews carried out in the field can be filmed and edited with inserts of historic photos, documents and excerpts of videos to interpret different elements of intangible heritage and disseminated on the Internet. Audio recordings of first person witnesses of special events are very efficient to evoke the memory of place and 3D photography enables visitors to virtually visit on the Internet places that are not accessible to the general public. It is possible to group these different media (text, 2D photos, 3D photos, sound recordings and videos) to interpret a site virtually by inserting in a 3D panophotography of a site a combination of various medias: short descriptive texts, historic 2D photos, 3D photos of archaeological objects associated to the site, sound recording to evoke the memory of place and video recording to present the living elements of the site (feasts, festivals, rituals, artisanal and artistic practices, etc.). Augmented reality and virtual reality offer new immersive and semi-immersive ways of experiencing heritage. The application of ethnographic field methods and digital technologies in the interpretation of heritage has become itself a new and promising topic of ethnographic research. The presentation is based on different projects carried out by the Ethno Media Lab over the course of the last ten years.

Politics, Digital Technology and the Public

Director Pierre-Yves Guillot and M.A. Charlotte Soubeyrand

In the last fifteen years, the political demand for museums and cultural institutions evolved. There has been an increasing desire to display modernity through "new technologies." Public funding has followed allowing cultural institutions to develop digital projects to meet this demand. Numerous museums are now equipped with touchscreens, tablets, virtual reality headsets, mobile applications, and QR (Quick Response) codes. Some of these digital projects were opportunistic, and they did not include general reflections on the type of content to broadcast, the audiovisual writing to use and especially on the use of technology in the context of an exhibition viewed by the public. In some cases, these digital devices bring little added value in terms of cultural mediation and only add technology to the exhibition.

Nevertheless, when used well, these new technologies can be a helpful tool for the visitor. There are numerous possibilities for their use to open the accessibility of museums for various groups with limitations – in particular visual and hearing.

What method can be used to ensure the proper use of these new technologies and how to integrate them in a relevant way into a tour of a museum?

W2B Railways in the Making of Modern Societies 2

Location: H 13

Organiser: Timo Myllyntaus

Chair: Hugo Silveira Pereira

The Electrification Try-outs in Stockholm, 1905-1907

Lecturer Roine Viklund

This paper will analyse the innovation processes (knowledge-building, technology transfer and technology development) before and during the railway electrification try-outs in Stockholm, 1905-07. The results of these tests were later to form the basis for Sweden's first state railway electrification. Riksgränsbanan, the almost 130 km long northernmost section of the Iron Ore Line (Malmbanan) between Kiruna and the Norwegian border, was electrified in 1910 – 1917. This was to become the world's northernmost railway electrification.

Imported coal was the dominating power source in Sweden at the end of the 19th century and the Swedish government wanted to decrease its importance. It was mainly two reasons for that, the first being to reduce the tremendous costs involved and the second to enhance national security. As both transport systems (railway and shipping) and industry were totally dependent of imported coal for fuel, they were very vulnerable to conflicts abroad such as strikes, lockouts and war. If the import was disturbed, it would have significant consequences for the nation.

One solution to these afore mentioned problems was to electrify the Swedish state owned railway lines and using nearby waterfalls as power supply. A state commission was established already in 1899 in order to investigate which waterfalls were suitable for hydroelectric development. After several investigations and studies, The Royal Railway Board decided to conduct electrical railway try-outs in Stockholm, 1905-07. A number of technical components and systems were tried and analysed at two railway lines in Stockholm, for instance overhead wire systems, voltages, insulators, and locomotives.

This paper will thus examine and analyse which technical systems and components were selected, how the tests were conducted, and finally the results and consequences of the try-outs.

Conquering the Land: Nazi Germany's Railways in the Far North

Ph.D. candidate Mari Olafson Lundemo

The Nordic countries are characterised by a rather difficult geography when it comes to construction of infrastructure, and which has made travelling and transportations rather challenging, particularly in the northernmost areas. During the Second World War, these areas were of particular interest to Nazi Germany, mainly for strategic reasons, but insufficient infrastructure made the movement of troops and supplies difficult. When Germany gained control over occupied Norway and access to allied Finland in the early 1940s, a priority was therefore to develop the infrastructure in the north, focusing mainly on railways. The project of extending the railway network in Norway progressed slowly and steadily over the war years, under the supervision of the Wehrmacht and engineers from Organisation Todt.

In Finland, the German plan was to build a more than 500 km long field railway parallel to the Jäämerentie, the only road connecting the “capital” of northern Finland to its northernmost outpost Petsamo, which was incorporated in the young republic in the early 1920s. The Finns had actually considered the possibilities of constructing this railway before the war, but abandoned the plan due to the difficult geography, and soon enough the Germans were forced to do the same. However, the dream of building this railway lingered in the mind of a German engineer, the head of Organisation Todt in Finland. I would argue that the idea of the railway was, besides being a part of the German war machine, to conquer the hostile landscape which caused so much trouble for the German troops and to display the superiority of German engineers. Furthermore, Hitler emphasised that the railway was going to be built by exploiting the labour of 10.000 Soviet prisoners of war, highlighting the human costs of infrastructure construction, that also served as a way of defeating the enemy.

Railway and Internet Infrastructure – Similarities and Differences

Researcher Olli Sjöblom

Professor Reima Suomi

Professor Timo Myllyntaus

Some 200 years ago, the first ideas of railway transportation were laid. Internet had its origin in the 1950s – also a remarkable history of some 60 years even here. Although both railways and Internet are central infrastructures, they are scientifically seldom compared and jointly analyzed, except (Latora & Marchiori, 2005; Suomi, 2005). Yet we might get a deeper understanding of characteristics of network operations by analyzing these different but also similar infrastructures.

Railways and Internet are technical artefacts and innovations but they must be seen as socio-technological systems that need the support of organizing (Mitev, 1996). Carr (2004) has identified the resemblance between the infrastructures: "Many contemporary commentators have noted the resemblances among these technologies, and have identified particularly strong parallels between the rollout of the rail network in the mid-1800s and the expansion of information technology, particularly the Internet, in the late 1900s." For example, it is very well known that the introduction of railway traffic very much contributed to the acceptance of standard time (Carradice, 2012).

This paper identifies the basic properties of network infrastructures, and discusses the cases of railways and Internet illuminated by them. Especially the interface between the two infrastructures is taken into scrutiny. Four areas of infrastructure are particularly discussed: First, the physical infra-structure comprising of human-made technology. Second, human infra-structure supporting and developing the whole. Third, the organizational infrastructure needed to govern the infrastructure. Fourth, each infra-structure needs a related knowledge base to support it.

References

*Carr, N. G. (2004). *Does IT matter?* Boston: Harvard Business School Press.*

Carradice, P. (2012). The Great Western Railway creates standard time. Retrieved from <http://www.bbc.co.uk/blogs/wales/entries/8d6d68fa-1e6a-39e1-9f29-232450445f41>

*Latora, V., & Marchiori, M. (2005). Vulnerability and protection of infrastructure networks. *Physical Review E*, 71(1), 015103.*

*Mitev, N. N. (1996). *Social, Organizational and Political Aspects of Information Systems Failures: The Computerised Reservation Systems at French Railways*. Paper presented at the Proceedings of the Fourth European Conference on Information Systems, Lisbon, Portugal.*

*Suomi, R. (2005). Management of infrastructures - what can the internet developers learn from the history of railways? *Journal of Management History*, 43(6), 896-905.*

W2C Technified Bodies at Work

Location: H 14

Organiser: Karsten Uhl

Chair: Karsten Uhl

Body against Soul? German Psychotechnics and the "Whole Worker"
Dr. Kevin Liggieri

This paper will investigate how engineers and psychologists (psychotechnicians) operated with the concept of the German term “whole human” during the 1920s and how this concept can be situated between the ‘human engine’ (energy-paradigm, „human motor“) and the information theory of the 1940s and 1950s. The programmatic term means to conform machines intuitively to the psychological and physiological characteristics of man. In this term the idea of affordance and usability is coming up with a new model of man; a model, which is not just a physical body of the worker. Here German engineering science and practical psychology considered man as a ‘living factor’ as well as a problem.

This theory is unlike Frederick W. Taylor’s idea of scientific management, which remodelled the human being almost into a mechanized worker. Fritz Giese, a famous psychotechnician, responded to this debate with his “object psychotechnics”, a concept to assimilate the environment to the “whole worker”. In this “object psychotechnics” the economic movement or operation should always be intuitive and energy saving. This discourse was rather discovered by engineers as by psychologists and shows in its theory and in its human-centred machine-design a new focus on the worker as a living and complex object. By this redefinition of the human as a demarcating factor of the problem between mechanization (physical body) and the living (physis), Giese was able to draft a technical adaptation of the environment to humans. This presupposes that man as a complex being needs an optimal environment to be able to work efficiently.

This paper looks into the history of technical, biological and philosophical visions of human optimizing by the adaption of machines. The analysis focuses on the discourses of biology, philosophy, and technics as well as their apparative practices.

Discipline and Alcohol: Power, Bodies, and Infrastructure Construction around 1900

Dr. Eike-Christian Heine

The human body was the motor, which drove the construction of the infrastructures of European modernity. These bodies were “fuelled” with alcohol. On one hand, alcohol was sold on credit to labourers, thus putting them in debt and binding them to the site and to the contractors. On the other hand, the consumption of alcohol offered brief escapes from demanding, monotonous labour, the life on the country road, and an overall heteronomous living situation. Alcohol stabilised the power relations on the building site in what was called the “Truck System”. While the disciplining effects of piece work and alcohol ensured the continuous movement of bodies, at the same time work and alcohol wore down, threatened or even destroyed the bodies of the individual worker.

Closely reading autobiographies of earth workers and contextualising them with engineering handbooks, the writings of social reformers and other sources, I argue that the conditions for these migrant labourers continued to be largely pre-modern until well into the twentieth century. Their bodies remained unchanged to the new scientific and popular representations and technologies of the body that developed around 1900 (e.g. rationalisation, bureaucratisation), while they build the iconic infrastructures of Modernity, thus reminding us of the “Shock of the Old” (Edgerton).

History of Technology Meets History of the Body – Miners` Bodies in the Age of Rationalization

Dr. Lars Bluma

Labour history focuses increasingly on the mutual interaction of the worker`s body and its workplace environment. Consequently, researchers give more attention to the problem of working diseases caused by the industrial environment. This renaissance of occupational health and safety as an important subject of history brought specific topics to the fore: the hazardousness of work processes, the culture of work and risk, the influence of gender on occupational health, the role of complex networks including a wide range of actors and institutions like workers, engineers, medical experts, scientists, insurance companies, the government, managers and entrepreneurs, as well as the regulation of the working body through a regime of control techniques.

Especially in the age of rationalization biopolitics became an important lever to bind together discourses and actions, which had the goal to increase the performance of industrial work by using new scientific methods and new technologies. Therefore, the body-machine relationship at the industrial workplaces and the health consequences of mechanization became the focal point of biopolitics in the 1920s. The presentation will demonstrate this shift in biopolitics with the example of coal mining at the Ruhr. Especially the introduction of the pneumatic pick and the shaker conveyor in German coal mining will be discussed within the methodological framework of body history.

Production Technology and the Body of the Shipyard Worker

Dr. Christian Ebhardt

The paper investigates the human-machine relationship in the context of debates on working conditions in German shipbuilding during the 1970s and 1980s. Even today shipbuilding has a very unique production system that is rooted in single piece production. It situates the shipyard somewhere between a workshop, a construction site and a factory. Due to the complexity of the production system, the frequent use of toxic materials and often strenuous work, shipbuilding is a very high risk industry concerning workers health and safety. The handling of these risks changed over time and was closely linked to the development of production technology. In this context the increasing use of technology was a two-

sided sword. On the one hand new technologies and materials often produced new risks, while on the other hand it was widely used to mitigate them.

The 1970s were a period of intensive change, not only seen from a more general societal perspective, but also within the shipyards in particular. From the middle of the 1970s onwards a deep shipbuilding crisis led to a profound capacity reduction throughout Western Europe. At the same time companies came under increasing internal stress with growing demands for better working conditions and work place security. At the Bremer Vulkan – one of the major shipyards in Germany – the New Left tried to gain access to the shipyard through numerous leaflets and newspapers that were handed out to the workers. Improved working conditions were an integral part of their agenda. In response to these publications the management issued a company newspaper for the first time. By putting a specific focus on the body of the shipyard worker, the paper aims to analyse the shifting debates of the period as well as their key actors.

W2D Approaches to Technological Utopias and Paradigms

Location: H II

Organiser: PC

Chair: Antoni Roca Rosell

Utopias and Dystopias of Media Technologies in History

Dr. Jukka Kortti

Media – a form of expression or a medium enabled by communication – have been a crucial factor for humankind throughout history, at least since the early-modern era. Media technologies have remoulded work and leisure. Media have played a vital role in human intercourse, and in how people divide their lives between private and public. Therefore, through media history we are able to articulate realised and unrealised visions, ideologies, worldviews and mentalities that shape our sense of both modern and late-modern ways of life.

One outcome of this significance of media is the expectations a new medium is often loaded. For instance, the printing press was seen ending oppression when people are more free individuals and know their rights, or Silicon Valley promises how the revolution of the online technologies will save the world. On the other hand, a new medium is associated with dystopias such as how ‘information overload’ is changing the structure of human brain.

Although almost all new technologies carry potential to both happiness and distress, one can say that the phenomenon has double meaning when it comes to the media. Besides that utopias and dystopias are embedded in new media innovations, they are also represented in media. Science fiction in literature, cinema, television, computer games etc. has a significant role in how we perceive new technologies, including media technologies.

In my presentation, I will show by examples what kind of dystopias and utopias new media technologies have been associated in the history of media. I am particularly interested in how these visions of media technologies are changing the worldviews of people – consciously or unconsciously.

Back to the Future: Collapse and Technological Utopia in Science Fiction (In French)

Professor Bertrand Guillaume

In this short paper, I examine the possibility in a speculative framework whether one can today think and observe tendencies referring to the scenarios of global ecological catastrophe, of which I also recall the main scientific bases and the general content. Based on a reading of Isaac Asimov's famous three-volume science-fiction masterpiece "Foundation", "Foundation and Empire", "Second Foundation", regarding it as a normative prospective exercise which itself is based on history (in this case the fall of ancient Rome), I explore the idea of a predictable collapse of civilization in the Anthropocene, as well as the role of techno-science in this framework both as a means of knowledge and as an excess of consequences. I suggest that, at least in this case under study, science fiction can help us to sketch out theoretical and practical solutions for sustainability, and consequently provide a remedy for nihilism. At the end of presentation, some more general implications for the history and philosophy of techniques of technological utopia in science fiction and popular culture are discussed on the basis of references that extend to some other literary works.

Internet Imaginary: Reflections on Masoud Khayam and Technology's Horizon of Expectations

Professor Babak Rahimi

Since the 1990s the Internet as a new communication technology has become an everyday means of interaction, economically global and politically significant. But Internet also has been an imaginary site of contention, ways in which, as Kosellek famously described, the temporality of future as horizon of expectations is meant to be realized. This paper examines the techno-utopian writings of Masoud Khayam, an Iranian philosopher and writer, whose scholarly works range from science studies to literary critique. The paper argues that Khayam's depiction of Internet technology in the 1990s signifies a distinct technological imaginary that envisions Internet as a scientific sojourn into an interconnected utopian tomorrow. Internet is not just a tool of communication, but a way of existential transportation into human autonomy and liberty based on perpetual connectivity. While critical observations are made on his works, the paper fundamentally situates Khayam's technological utopianism within Iranian history but also the broader post-Soviet conception of technology as a generative force as a global phenomenon revolving around what Haraway described in her "Manifesto for Cyborg" as "needy for connection". The paper finally looks at the

post-1990s conception of Internet and argues for a new technological imaginary that is neither dystopian nor utopian, but heterotopic.

Throwing Light on Photonics: Genealogy of a Technological Paradigm

Dr. Marcin Krasnodebski

What is photonics? This fashionable concept got increasingly popular over the last thirty years. In spite of its attractiveness, its exact meaning is far from clear as it is used by different professional groups in different contexts. Some consider it a new science of light destined to replace optics, others see it as a technology competing with electronics, others still as a new disruptive branch of industry. Based on the policy reports and articles from the last few decades, such as the American 2011 report “Optics and Photonics: Essential Technologies for Our Nation”, we try to understand these various uses and ponder on their meaning. I argue that the lack of a single definition hinders the introduction of rational technological and industrial policies to foster the development of photonics. I ask the question whether there is an overarching framework that might capture the essential characteristics of various perspectives on photonics and yet build a more coherent understanding of this term. I make use of a concept of “technological paradigms” developed by Giovanni Dosi in the 1980s, and then applied to photonics by Ernest Sternberg in 1993. Stemming from Kuhnian scientific paradigms, the technological paradigms are a tool for capturing complex technological phenomena on the historical scale. Seeing photonics as a technological paradigm allows tracing more firm borders of the concept, thus delineating the area of possible policy interventions. Invoking Sternberg’s criteria for technological paradigms may also open a discussion on the pertinence of similar concepts in history of technology, as well as on their utility in interacting with other disciplines.

Hyperobject and Hyperhistory: Remnants of Hiroshima

Dr. Mitsuhiro Hayashi

*What Timothy Morton called hyperobjects in *Hyperobjects* (2013) are objects which cannot make networks with humans unlike objects captured by Bruno Latour’s actor-network theory. Morton characterized hyperobjects by viscosity, nonlocality, temporally undulating and constantly phasing. At the end of this book, Morton mentions the human shadow which was inscribed on architecture by the atomic bomb’s ray and remains in Hiroshima. The concept of hyperobjects also raises the question regarding socio-historical memory. In terms of the relationship between mass death and socio-historical memory during World War II, there are sophisticated debates on how we can memorize or narrate the Holocaust. Of course, in the postwar era, a number of people have discussed the*

problem of socio-historical memory on the atomic bombing of Hiroshima in the history of Japan. Yet, if we consider the atomic bomb as a hyperobjective technology in the Anthropocene, we would have to rethink socio-historical memory of the atomic bombing without simply reducing it to a part of the history of Japan or the United States. In this paper, I address the following questions: What problems are there in terms of capturing the past of the hyperobjective technology, what kind of statuses do socio-historical words and images, including the human shadow, have in relation to the atomic bombing, and what kind of the archive should be configured as a vehicle for digging into the past of the atomic bombing. In the conclusion, I argue that if we think about the past of the atomic bombing, considering its atemporality and aspatiality, capturing the past could not help but oscillate between history and ahistory. For this reason, every discursive word and visible image should be treated as partial indexes for ahistory.

W2E Technological Momentum: From Gunpowders to Modern Explosives and Propellants I

Location: HR 5

Organiser: Brenda Buchanan, Yoel Bergman and Steven Walton

Chair: Yoel Bergman

Shotgun Momentum? Diversity in Early Modern Gunpowder Mixtures

Professor Steven Walton

*The rise of gunpowder weaponry between its appearance in Europe in the mid-fourteenth and its ubiquity by the late sixteenth century is often told of the inevitable march of progress and of “war-winning weapons”. Such simple momentous stories of technological momentum, if not technological determinism as well, have already been given much more nuance by previous scholars in terms of the use of the weapons, their technology, their procurement and spread, and cultural attitudes towards them. What I propose here is to look at what might be called *internal momentum* in the development of gunpowder weaponry by looking at the internal ballistics of gunpowder development over this period.*

The core of this work is based on recipe texts, mostly from the sixteenth century, whose most notable characteristic is their diversity. This raises the fundamental question: If there is one optimal gunpowder recipe (today said to be quite close to an 8:1:1 mixture of saltpeter, charcoal, and sulfur), then why are there literally dozens and dozens of quite wide variations of that ratio, as well as innumerable additives that purported to change the characteristics of the gunpowder (though to be fair, a great many of these recipes simply indicate the addition of these additives, but make no statement about why they are added or the effects they’re supposed to produce)?

This paper will also present some preliminary findings about gunpowder mixtures based on computational chemical kinetics, which, although an imprecise study due to the nature of the understanding of how black powder detonates, still provides some interesting qualitative sense of what was going on in all these mixtures. Ultimately, I argue that while it is true that gunpowder weaponry gained momentum throughout these two centuries, and I will propose that as we all recognize determinism is problematic and technological momentum complex, perhaps we should be speaking instead about technological thresholds—in performance, perception, economics, or any other number of factors individually or combined—to help explain change over time in the history of technology.

Exhuming Trodden Earth: Technologies of Saltpeter Production in Korea, 1592-1698

Ph.D. candidate Hyeok Hweon Kang

*The manufacture of saltpeter has a long history on the Korean peninsula, where gunpowder was first transmitted from China in the mid-fourteenth century. Yet, this existing technology was revamped at the turn of the sixteenth century, when Japan invaded Korea and introduced the matchlock musket. The musket used corned powder with higher saltpeter content—as much as 78.4% in Korean powder, and this required the Korean state to assimilate newer and more efficient technologies of saltpeter production. For about a century, from 1592 to 1698, Koreans sought to augment their saltpeter industry through domestic policies that incentivized individuals to innovate as well as diplomatic ventures that smuggled technologies from Japan and Korea. In this paper, I examine the provenance and technical details of these technologies and explain how one of them eventually became dominant by the end of the seventeenth century. Crucial for understanding this technological “closure” is two “saltpeter-cooking” manuals: *Annotations on the New Method of Saltpeter Extraction* (新傳煮取焰硝方諺解) from 1635, and *New Method of Saltpeter Production* (新傳煮硝方) from 1698. The latter, which Koreans recognized as more effective, differed from the former method as well as the European nitric-beds in that no manure was used. Instead, it established a new way of processing “trodden earth” scooped from the streets, where the traffic of men and horses was thought to have made a suitable soil for saltpeter. This technology is suggestive for the comparative history of saltpeter, as its emphasis on finding urban solutions to saltpeter production differs from the reliance on rural farms in other regions.*

Future Scenarios for the Safeguarding and Musealisation of the Vale de Milhaços Gunpowder Factory

Researcher Graça Filipe

The Vale de Milhaços Gunpowder Factory, located in the council of Seixal (Portugal) is an industrial heritage site classified as a monument in the public interest. As a heritage concept, this joined the EMS – the Seixal Municipal Ecomuseum - in 2001, following the donation to the municipality by its owners of the Black Gunpowder Circuit within the framework of a local development project. The original installations of the Black Gunpowder Circuit reach back to the late 19th and early 20th centuries.

The Black Gunpowder Circuit features both buildings and production equipment. The mechanical energy is relayed to the grinding, cartridge filling, mixing, sieving, granulation and polishing workshop facilities through a system of suspended cables with a longitudinal layout spanning around 500m. The industrial heritage of the Black Gunpowder Circuit, in Vale de Milhaços, an extension of the EMS, currently operates as a museum. An operator undertakes the role of boilerman and machinery operator with the steam generator and machinery still remaining fully functional.

This work aims to present and provide the discussion on the future scenarios of the heritage safeguarding and valuing, through the project of musealisation, of the Black Gunpowder Circuit. Based on the balance of the last decades of work and a recent diagnosis of the buildings conservation, we draw a plausible scenario following the current intervention methodologies, within the framework of the current public policies for the culture heritage in Portugal. To this scenario, however, we oppose another one, which would imply a change of heritage management paradigm and the resources that are allocated to it, in order to make possible the safeguarding of one of the industrial sites in the Portuguese (and possibly European) territory with greater potential for studying technologies production of powder by discontinuous process, with mechanical steam power, inherited from the late 19th century.

W2F Electronics and Computers in History

Location: H 26

Organiser: PC

Chair: Susan Schmidt Horning

Monster Computer vs. Grassroot Computing: The Early Computer Culture in the US, 1944-1953

Mr. Richard Vahrenkamp

The military strength of the US armed forces relied on a strong air force and on the atomic bomb. However, other than the historiography of early high speed digital computers (monster computers), as ENIAC and the von Neumann IAS machine, may suggest (the latest book on ENIAC was that of Haigh, Priestley and Rope 2016) there was no need of high speed digital computers in the US weapon factories. Neither the aviation industry at the West Coast producing bombers and

fighter planes (Lockheed, Boeing, Douglas, Northrop) nor the atomic bomb production campus in Los Alamos issued a request of an urgent need for a high speed digital computer.

Whereas the high speed digital computer was a technology push of mathematicians and oriented to academic needs, engineers at Boeing and Northrop built small analog computers that were taylor made for their needs and offered them inside the aviation cluster.

The concept of the high speed digital computer was to link the high speed arithmetic unit with a high speed memory. But a high speed memory was difficult to attain. The mathematicians did not take the slow magnetic drum memory into account. Surveys showed that the overwhelming number of digital computers that were employed in the US did not contain high speed memories but drum memories. IBM draw the conclusion from marketing studies in the aviation industry that there would be a market for drum electronic digital computers and announced the IBM 650 machine in 1953 and released it successfully since 1954 (the first mass produced computer), more successfully than its high speed digital computer 701.

Exploring History of Computing with Prototypes

Dr. Zbigniew Stachniak

Prototypes of computers play an integral role in the hardware development cycle. In a continuous process of iterating and improving that begins with the computer's proof of concept, a designer learns how the current design should be modified to achieve the desired parameters or revised if technological, financial, or other constraints make achieving the overall objectives no longer feasible. The prototypes are discarded as soon as their functionality is tested, performance measured, faults detected and analyzed. Occasionally, functional prototypes are publicly demonstrated in pre-announcement stage of the development cycle to attract the attention of the industry, target users, and venture capital.

After years, some of these prototypes end up in technology museums. When analyzed, they reveal the invention process, design strategies, and phases. They show what information and options were available to the design team: what the designers knew and didn't know, how well they understood what they were doing, and how that understanding shaped their decisions and created novel solutions.

The proposed paper is a case analysis of the role of prototypes in historical research on computer hardware and software. The analysis is focused on prototypes of the MCM/70 personal computer--one of world's earliest personal computers--introduced by a Canadian firm Micro Computer Machines in the early 1970s. The prototypes and their documentation are part of the Micro Computer Machines collection at York University Computer Museum, Toronto, Canada.

50 Years of the Development of Microelectronics and Society

Professor Vasily Borisov

Microelectronics started its development approximately at the same time as the ICOHTEC was founded: the birth of microelectronics is usually associated with 1959 in which John Kilby (USA) demonstrated the invented semiconductor monolithic integrated circuit (IC). Subsequent progress of microelectronics has been an expanding boom: the production of IC, coupling dozens of transistors, began in 1962, and in 1965 the large integrated circuits with 1000 elements on the chip appeared. The creation of microprocessors (Intel, 1971) along with the subsequent development of nanotechnology contributed to overcoming circuit limitations, and by the year 2000 the fantastic milestone – a billion transistors on a standard silicon chip - has been reached.

The progress of microelectronics has facilitated the development of information technologies, automation of production, and in essence, has extended man's intellectual power. However, in literature one can find many works that contain criticism of the existing approach to research and the organization of production in the field of microelectronics.

W. Patrick McCray in his paper “Will Small Be Beautiful?” considered the “nanotopian visions” to be a way of convincing lawmakers to fund research in nanotechnology.

A work “Nanotechnology and the Developing World” by Fabio Salamanca-Buentello with co-authors argues that the funding agencies must help ensure that nanotechnology is used responsibly by prompting the idea that it meet the needs of the entire world’s population and not just the needs of the wealthy.

The complex relationship between society and technology, coupled with an incomplete knowledge of what effects of innovations will be, mean that scientists and managers must be better equipped to realize values that are essential for human being.

Rise and Fall of the Romanian State-owned Micro/nanoelectronics

Dr. Andreas Wild

Micro/nanoelectronics started with the invention of the integrated circuit in 1958, enabled by the discovery of the semiconductor transistor in 1947. Its centre of gravity was in the Silicon Valley, but it was also developed elsewhere, including behind the Iron Curtain, probably because Lenin himself recognized the propaganda potential of the radio technology that later relied upon semiconductors. Romania nationalised its industry and run eight five-year plans starting in 1951, building an electronic ecosystem with a rather performant educational system; academic and institutional research; and industrial entities in components (including micro/nanoelectronics), equipment manufacturing, and services - exporting electronic products in COMECON, Western Europe, U.S.A.

Israel, etc. In 1989, there were 33 entities, employing a workforce of about 20,000. In micro/nanoelectronics, Romania acquired licenses and expanded them with own developments; started an international conference on semiconductors; had specialists publishing in peer-reviewed conferences and journals; and granted patents. Even its defectors made brilliant careers. This anecdotic evidence suggests that Romanian micro/nanoelectronics was not without merit. However, technical competencies could not overcome its structural handicaps: excessive vertical integration, to satisfy a domestic demand too small to generate economy of scale; inapplicability of economic metrics in a State-owned economy with non-convertible currency, reporting fictitious parameters like the “global production”; lack of basic skills in marketing and management in enterprises obliged to implement decisions from the State Council for Plan, the State Council for Prices or Communist Party directives. After the communist regime was ousted in 1989, the Romanian institutional research survived, but its micro/nanoelectronics collapsed. The industry privatisation, hampered by insufficient market understanding and by alleged corruption, could rescue only a small part of the assets. Nonetheless, the surviving elements could be the starting point of a renewal, if the country would make this strategic decision.

W2G Technology as a Tool and a Target of Intelligence Agencies in the Second Half of the 20th Century

Location: E IIA

Organiser: Miroslaw Sikora

Chair: Kristie Macrakis

Commentator: Kristie Macrakis

Stasi and Eavesdropping in the GDR in the Years 1956 – 1989

Researcher Detlev Vreisleben

As early as 1956, Department O of the MfS began to develop a manually operated interception system for room control and telephone tapping, which was called the A-System (telephone tapping) and the B-System (bugs). This system was in operation until the 1970s, only then it was replaced by a new system called CEKO (Centrales Kontrollsystem = Central Controlsystem).

In Karl-Marx-Stadt (today Chemnitz) for example, in 1971, the facilities located there were rebuilt and expanded from 10 to 22 room surveillance measures (called B-Measure) and up to 55 telephone measures (called A-Measure). In the CEKO system in Karl-Marx-Stadt were later 94 B-Measures and 376-A Measures.

In the paper the installation of the bugs and the various transmission methods are going to be explained. The intercepted calls could be transmitted via an audio frequency connection if a free line was available for this purpose. The audio

frequency bug consisted of a microphone and an amplifier as well as a power source (battery or power supply). The transmission went to an operational base and was transferred from there via a telephone line to the CEKO facility.

Another possibility of transmission was the carrier frequency technology, where the calls could be transmitted over a busy telephone line, a door opener line or the power mains. If no lines were available, radio transmission was selected. In the vicinity of the bug then a receiver had to be installed in order to establish the connection to the CEKO system.

In the central office, the intercepted calls were recorded on cassettes and later evaluated.

The GDR had 16 million inhabitants, 900 rooms talks as well as 4000 telephones could be intercepted simultaneously with CEKO in the 80s.

Hungary's Participation in the Technology Transfer during the 1970 – 1980 Period

Dr. Zsuzsanna Borvendég

The scientific and technological revolution had motivated Moscow to broaden its relationship with western countries since the middle of the fifties. Initially these relationships focused on the foreign trade, especially acquiring new technologies; otherwise the eastern bloc countries' competitiveness would fall behind significantly.

As a result of the Helsinki process and the tightened COCOM list at the late seventies the Hungarian intelligence had been issued a new territory within the teamwork of the eastern bloc's secret services: the scientific and technological intelligence, i.e. stealing the restricted technologies and licenses.

The backbone of this operation made use of the already existing offshore companies started from early 1970s. These offshore enterprises were established by Hungarian foreign trade companies to support frauds and other financial crimes. The operation of these offshore companies was beneficial for the intelligence services and the politburo for acquiring valuable technology for the members of the Warsaw Pact. As a compensation, they had provided a certain shield for the additional large scale illegal financial manoeuvres of the trade lobby operating the network. The financial loss due to these financial operations significantly increased Hungary's state debt.

I am going to present the most important Hungarian electro-technic companies, those which made use of the stolen technologies. I will also describe some of the channels and methods used to transfer the forbidden technologies to the eastern bloc and show examples of cooperating major western companies to delude the embargo.

My research based on the documents stored in the Historical Archives of the Hungarian State Security in Budapest.

Obtaining Strategic Intelligence by SIGINT – Surveillance of the President of Serbia S. Milošević by Croatian Intelligence Agency

Dr. Gordan Akrap

The use of SIGINT is not a special feature for all those who work in intelligence and security agencies. However, gathering data of strategic importance from opponent/enemy side, especially during the armed conflicts, is more an exception than a rule. If „collector” is successful in such intentions, the side that collects gains an important advantage in the strategic decision process in relation to the enemy/opponent side. Especially if the opponent/enemy side does not know that it is under surveillance. During the process of the violent break-up of Yugoslavia, Croatia was exposed by the aggressive acts of Yugoslav and Serbian (Serbs from Serbia, Bosnia and Herzegovina and Croatia) official and paramilitary forces. Serbian president Slobodan Milosevic was the key figure on the side of the aggressors. Thus, the Croatian leadership demanded from the Croatian security system to try to find a way, how to obtain reliable information on Milosevic's attitudes and intentions. Croatian agencies succeeded in organizing the surveillance of communications used by Serbian President Milošević. During the surveillance, many strategic data have been collected. The results were known only to a very limited number of persons. That fact remained a long and well-guarded secret until the change of Government after the elections in year 2000. New coalition appointed Jozo Radoš for the Minister of Defense. Shortly after he had received results of the intercepted conversations of Slobodan Milosevic, he met with chief editor of one of the political weekly magazines in Croatia and handed them over certain Milošević's transcripts.

This magazine immediately announced that they have the “world exclusive” how the Croatian security services can listen Milosevic's telephone conversation for years and that he was not aware of it. The security system in Serbia reacted immediately. Almost immediately, further surveillance of Slobodan Milosevic conversation was disrupted.

Author is going to show some of the documents that were published and explained the positive and negative side of responsibility towards sensitive activities conducted by the SIGINT agencies.

Comecon's Complex-Program for Scientific-Technical Progress 1986-2000 and the Role of the Intelligence Services' Community of Warsaw Pact

Dr. Mirosław Sikora

In the beginning of the 80s European Economic Community set up joint ventures in the R&D that included not only governmental entities but also multinationals. The series of international projects under the umbrella of “Eureka”, among them European Strategic Program for Research in IT, have been launched, covering almost every key discipline of innovative technologies, taking advantage of synergy-effect. Soviet Union observed accelerated integration in the West with growing anxiety and jealousy. According to the initial, and erroneous, assessments of the communistic intelligence sources, hidden aims of the ESPRIT resembled American Strategic Defense Initiative, pursuing rather military goal than economical one.

In 1985, endangered by expanding technological gap that seemed to be soon irreversible, the Comecon’s Executive Committee decided to announce Complex-Program for Scientific-Technical Progress 2000. The major concept was to set up effective interstate cooperation within the Comecon in order to overcome technological dependency on the West and to reduce its superiority in five crucial areas: microelectronics and IT; automation of production (Computerized Numerical Control); atomic energy; new materials (polymers, products of powder metallurgy, composites); and biotechnology. At that point of its development the Comecon was already addicted to illicit acquisition of know-how. Therefore individual Warsaw Pact’s intelligence agencies were integrated into Complex Program and the spies all around the world assigned to the mission of braking embargo and getting access to the cutting-edge solutions that could be of use for the socialist economies in the – as we now know - final stage of the race.

Author raises the question about the feasibility of this bold effort to enhance Comecon economical capabilities by applying of combined – legal and illegal measures. Special focus is put on official and clandestine patters of cooperation in triangle of Poland, GDR and USSR in the area of microelectronics, IT and automatic control. Analysis bases on published works of western think tanks, furthermore on documents from Polish, Russian and German archives.

W2H Reassembling Crops for Changing Climates

Location: E IIB

Organisers: Harro Maat and Maria do Mar Gago

Chair: Francesca Bray

Following the Cloud: Long-term Trends of Making Coffee Grow in Colonial Angola, 1898-1939

Dr. Maria do Mar Gago

This paper deals with the importance of Robusta coffee in defining the nature of Portuguese colonialism in Angola. It follows John Gossweiler, a Swiss botanist

who worked for the Portuguese empire for more than four decades. Author of the Vegetation Map of Angola (1939), Gossweiler was the man who asserted Robusta coffee (Coffea canephora) as an indigenous species to Angola, refuting the widespread idea that French missionaries had introduced it in this colonial space. By analyzing his reports about the missions conducted to the coffee-producing regions, this paper brings to light the agro-forest system invented in Angola to manipulate Robusta in the middle of its natural habitat. This habitat was, in Gossweiler's own language, the "cloud forests" (florestas do nevoeiro), tropical and mountainous forests permanently covered with fog during the dry season, located in Northern Angola.

It was hence in the middle of the forests and mountains, in places where Robusta coffee grew spontaneously, that the large plantations nurturing the Angolan economy and the Portuguese Empire were located. This paper argues that this environmental dimension, practically absent in the historiography of colonial Angola, is key to understand how Angolan Robusta became a global commodity. It offers an alternative view of Angola as a coffee economy, not only based on forced labour regimes and market opportunities, but more saturated with agency, giving African growers and the environment (Robusta coffee itself, its technological features, ecologies, evolutionary history, biology, etc.) also their due. Finally, this paper discusses the advantages and limitations of using the "cloud forests" as a category of historical analysis in order to unveil long-term trends of growing Robusta coffee in this part of the globe.

Jack of no Trade, yet a Probable King?

Dr. John Lourdusamy

Even in a newspaper known for its wide international outlook like The Guardian, one usually would not have expected a news item projecting an obscure Indian fruit as the 'miracle' food crop for the future. Yet Jackfruit (Artocarpus heterophyllus) - which is not much of a traded commodity - increasingly is seen to be the answer to the adverse effects of climate change on food crops (like wheat, maize and corn), predicted by the Working Group II report of the Intergovernmental Panel on Climate Change (IPCC) in 2014.

Jackfruit is grown [apart from other places in India] precisely in regions, which also have transnationally moved crops like rubber, coffee and tea. While these latter crops have received much scholarly and commercial attention, jackfruit, on the contrary, has had a marginalised existence - relegated as a crop for the poor or the cattle. This paper will explore in detail the relative place of the jackfruit in the new cropscales. It will elucidate how various elements of science and technology were earlier pressed into service for the 'moved' crops, and how the same modern science [with precise analysis of nutritional values, drought-resistance, etc.] and technology [processing machinery, value-addition, organisational and marketing mechanisms], aided with the science of climate change are poised to bring

significant changes to the very cropscales. This new fore-grounding of the jackfruit is also significant in the context of the increasing problems faced by crops like rubber. While climate was an important consideration in the formation of the cropscales dominated by the moved crops, the concerns of climate-change and new commercial calculations mark the impending reordering - with a more prominent place for the indigenous crop. The paper will highlight the complex interplay of commercial ambition, climate, science, technology and local agency in the creation of perceptions and the ordering of priorities over time.

Cultivating Oranges and Whiteness in the Global Mediterranean: South African Citrus Growers' Cooperative and Californian Practices of Cloning

Dr. Tiago Saraiva

This paper explores modes of writing transnational history by following oranges across Mediterranean environments. It focuses on cloning practices developed by A. D. Shamel in Southern California in the 1910s and their importance in maintaining and expanding a community of orange growers who embodied an alternative to the unbridled capitalism of America's Gilded Age. It then tracks oranges out of California into South Africa revealing the importance of Shamel's techniques in imagining race relations in the British Empire through the transformation of the Sundays River Valley in the Eastern Cape into a citrusscape.

I approach the travels of oranges from California into South Africa as movements of thick technoscientific things that bond science, technology, and politics together in a continuum. This complicates the traditional narratives of plant transfers by environmental historians who tend to take for granted the nature of both what travels from one place to the other and the different local climates. More recently, historians of capitalism have produced influential transnational narratives focusing on commodity chains, but they have disregarded the materiality of things in circulation. In this text I detail what travels and what gets transformed when technoscientific things move: knowledge, social institutions, labor practices, as well as democratic ideals. By doing this, I aim at probing the value of history of science and technology in identifying concrete transnational historical dynamics tying different spatial realities.

Temperate and Tropical Rice across the Atlantic: How the Americas became a Breeding Site for Asian and African Rice Farmers

Dr. Harro Maat

The historian and geographer Judith Carney labelled the small plots where African slaves were allowed to grow their own food 'the botanical gardens of the

dispossessed.' By growing crops and medical plants they had brought with them, enslaved Africans maintained some of their cultural identity, creating social confirmation and mental support in surviving the harsh conditions. In this paper, it is shown that these plots were also testing grounds, making the Africans not only conservationist but innovators too. The focus of this paper is on rice, a crop with many varieties, grouped according to morphological features and the major geo-climatic zones where they grow. Because Africans ended up in a variety of climatic zones in South, Central and North America, when they engaged in rice farming they selected varieties fit for the specific environments their farm was located in. Specific attention is given to Suriname and British Guiana after the abolition of slavery. British and Dutch colonial experts got an interest in the rice farms of the ex-slaves as well as from the ex-indentured labourers from Asia. Several of the varieties grown by these farmers were introduced back to rice farmers in Africa and Asia. The emerging rice farms in the Americas thus became an important source for improvement of the rice crop across the world. The paper follows some of the specific rice varieties in their travels and how they became icons for globalization at the one hand, and adjustment to specific geo-climatic zones on the other.

Wednesday, 13:30 – 15:00

W3A The Conquest of Hydraulic Power and its Place in the History of Mankind (in French)

Location: H 21

Organisers: Alexandre Herlea and Mircea Ivanoiu

Chair: Alexandre Herlea

Hydraulic Turbine Technology Disruption to Cope New Power Generation Paradigms (In French)

Professor François Avellan

After more than a century of steady development, Hydropower today represents the largest share of renewable energy generation, close to 17 % of the worldwide overall electricity generation, featuring more than 1100 GW of total capacity. This power capacity is expected to be further doubled within the next 30 years. However, the paradigm-change behind the energy transition forces hydropower plants to expand their dispatching capacity and further support the electrical transmission system in integrating the increased amount of intermittent renewable energy sources. Hydropower plants shall be forced to support the grid with the integration of solar PV and wind energy to secure their share in both actual and future electricity markets, and so help to further contribute towards the reduction of greenhouse gas emissions. Nowadays hydropower plants already significantly contribute to grid balancing since this energy source is dispatchable and has some fast regulation capabilities (above 30 s response time). However, they are not fast enough to participate in the fast response markets. The presentation will outlook the technology disruption to be applied to the hydropower plant hydraulic and electrical machinery for keeping hydropower competitive by supplying multiple added value ancillary services to the electrical power system. The case of the Francis turbines will be presented through recent hydropower projects.

Exploitation of Hydraulic Energy in Rural Traditional Technology, in Romania. Resemblance and European Synchronism (In French)

Dr. Mircea Ivanoiu

Professor Alexandre Herlea

Without being a continental or international exception, Romania represents an area of early usage of hydraulic energy as primary energy.

Due to the fact that such machines used in times, previous to modern age are achieved on intuitive and empirical bases, for personal and community usage in rural areas, ethnography was the science that dealt with their study.

The paper intends to present the usage of water energy in some peasant autarchy household activities and compares the machines used in Romania with those used in other parts of Europe (Valais, France).

Constructive and functional solutions in some fields of activity are described in this paper, namely:

- in food industry, the processing of grains to obtain flour;*
- in textile industry, the processing of beaten, carded and washed cloths;*
- in wood industry, for furniture and building (board and timber)*

In analyzing these examples of empirical exploitation of water I had in mind the pages written by known historians of science and technology in the field (Maurice Daumas, Ian McNeil Charles Singer)

In the first half of the last century, engineers - builders of classical hydraulic turbines (Pelton, Francis and Kaplan) made some attempts of theoretical foundation of the functioning of old hydraulic wheels. We will analyze the proposals of PhD Eng. Dorin Pavel, the most known Romanian designer of hydraulic machines and equipment for the hydro energetic plants at the beginning of this industry in Romania.

The paper is illustrated, besides historical photos, with some quite recent images of still functioning or abandoned equipment, on small rivers in the southern Transylvania.

Aurel Bărglăzan (1905-1960), Founder of the Hydraulic Machinery School in Timisoara, Romania

Professor Mircea Octavian Popoviciu

Graduate of the Timisoara Polytechnic School (1928) is retained as assistant professor by the professor Plautius Andronescu. In 1940 sustained his Doctoral Degree thesis with the work "The Hydraulic Transformer. Theoretic and Experimental Study". As a result of his great professional performances and his leadership qualities he became Dean of the Electro Mechanics School (1944-1948) and afterwards of the Mechanic School (1948-1960).

To illustrate his wide range of concerns we will remember some published works: Kaplan Turbine Adjustments (1932), Hydrodynamic Field of Kaplan Turbines (1934), The Hydraulic Transformer (1940), Theoretical and Experimental

Researches upon Hydraulic Coupling (1958). From the beginning of his career, he reached at the conclusion that mastering modern theories doubled by the laboratory verification capacity must not remain a final purpose, but is only the first phase for high level technical achievements. Applying this conviction, he involved himself in the achievement of numerous industrial objectives: Barglazan pump for blast furnaces (1942), Pelton and Francis turbines for Crainicel Hydroelectric Power Plant (1948-1950), Kaplan turbines for Targu Mures Hydroelectric Power Plant (1952).

In 1955 became corresponding member of Romanian Academy and leads the Hydraulic Machinery Section of the Timisoara Base of the Academy. In the same year he initiate at Resita Machine Construction Factory a Center for Researches, Design and Manufacturing of Hydraulic Turbines, which afterwards equipped more than 150 Hydroelectric Power Plans in Romania, Europe and South America. A tragic destiny abducts him in October 1960 when he was at the maximum point of his creative capacities.

Hydropower Infrastructure on the Upper Course of the Dniester River: Historical Evolutions and Perspectives for the Ukraine – Republic of Moldova Relations (In French)

Dr. Dorin Dusciac

Management of hydropower infrastructure on transboundary water courses is subject to a number of international treaties, conventions and regulations. Hydropower plants usually have a non-negligible impact on the ecological systems of the concerned river basin, thus environmental issues are at the core of the above-mentioned legal documents. As part of a system of international relations in continuous change, “environmental diplomacy” is a key component of modern inter-state paradigm.

*In this article, we present the development of hydropower generation infrastructure on the upper course of the Dniester River, from the 1970's to present times. Since the independence of Ukraine and Republic of Moldova in 1991, the Dniester became a transboundary water course, with significant subsequent change of the river's basin management rules. Over the past 25 years, Ukraine is seeking to tackle its electric power generation deficit and to increase the percentage of renewable energy in its energy mix. In its Western region, these goals can be achieved by substituting polluting coal-fired thermal plants with new hydropower facilities. Six new hydropower plants are planned to be built on the upper course of the Dniester over the next ten years. These plans raise a number of serious concerns, especially from the neighboring Republic of Moldova (including its separatist Transnistrian region, which will be directly affected). In this case study, we present the evolution of the legal regulatory framework, from Soviet-era centralism to new geo-political reality created by both countries' accession to the Energy Community Treaty (2010) and the implementation of the *acquis communautaire*, as part of each country's Association Agreement to the European*

Union (2014). Major changes of several characteristics of the region (demography, state of ecological systems, geo-political aspects, etc.) over the past decades are outlined with supporting evidence.

W3B Railways in the Making of Modern Societies 3

Location: H 13

Organiser: Timo Myllyntaus

Chair: Robert M. Schwartz

Railways and Global Integration: Remarks from an African Historian's Perspective

Researcher Norman Aselmeyer

One of the most challenging and fundamental problems in the history of technology concerns the relationship between infrastructure and society. Buoyed by the impact of the railway on the process of industrialization and nation-building in Europe and the United States, historians have considered it as a crucial engine of social change. Classical accounts of transport history highlight the potential of railways to overcome geographical distance and connect previously isolated places and people, thus contributing to political integration and socio-economic cohesion. Global history has only recently embraced that narrative and underpinned the railway's characterization as critical media of global integration. However, a view from African history reveals the inadequacy of that notion, exposing the integration talk as a myth of railway historiography. In regard to the continent's colonial past, railways were mere "drainage tools" of single track lines that linked points in the hinterland with a coastal port. A study of the transportation map shows, that the provision of railways in Africa was confined to limited spaces, neither crossing borders nor forming even basic networks. Instead of tying together regions and promoting domestic trade, railways consolidated the outward orientation of imperial spaces. Using the example of the Uganda railway, built by the British at the end of the nineteenth century in East Africa to link the Indian Ocean port of Mombasa with Lake Victoria in the interior, I argue that colonial railways had the propensity to disintegrate traditional structures of spatial and social cohesion. Rather than 'globalizing' just another territory, railway construction caused a multitude of spatial transformations.

The Indian Railways: Negotiating Space & Time in a Colonial Context

Researcher Vanshica Kant

This paper investigates an aspect of the social history of the railways in India that has received little academic attention: the passengers on the Indian railways. This work demonstrates the ability of local passengers to contest, bargain and negotiate their space and time on Indian rail through the fault lines of class, religion, caste and gender, both coincidentally and consciously, subtly and sharply.

By analyzing railway carriages, platforms, and timetables, this work will investigate the friction between the railway management and Indian passengers, and more importantly the tensions amongst Indian passengers themselves. In the process, it breaks down a number of prevailing dichotomies that marked these two categories, such as the binaries of colonizer and colonized, agent and patient, and global and local. Focusing on the period between 1880-1905, this paper examines the geographical regions of the United Provinces, the Great Indian Peninsula and Bengal.

By using a variety of primary sources such as railway proceedings, vernacular newspapers, travelogues, contemporary books, fictional writing and folk songs, this work challenges the conventional notion of the railways as a purely egalitarian, secular, and ordered space by arguing that it was hierarchized, chaotic and irrational as well. This work will exhibit the dynamism of 'local' forces in crystalizing and naturalizing the 'global' technology of the railroads. It will highlight the capacity of the local passengers to particularize and peculiarize this big infrastructure. It will depict how the spread of technology in the colonial context was not merely a modular process of duplication and replication from the metropolitan, but one based on acclimatization to and acculturation in the colony. In conclusion, this paper will holistically showcase that the processes the railways unleashed – that of technology transmission and creation of social space – were a product of new social relations that were veritably and viscerally Indian.

The Biggest Railway Catastrophe in the History of Romanian Railways: Context, Causes and Consequences

*Researcher Eduard Cotorobai
Professor Liviu Alexandru Sofonea
Professor Victoria Cotorobai*

The context in which the accident took place was decisive: The counter-defense of the Central Powers' armed forces, which began in September 1916 and the subsequent occupation of Bucharest, led, from October, to the exodus of a large part of the population towards Moldova. The refugee government and the royal house in Iași have accentuated the withdrawal of the civilian population to Moldova, the number of those evacuated during that period being of approx. a million and a half people, as the population of the Old Kingdom was nearly eight million.

The accident occurred in the context of this massive retreat. It took place on 31 December 1916/13 January 1917, in the full swing of the First World War, at the station in Ciurea locality, south of Iasi, on the railway station Barlad - Iasi.

The paper highlights the politico-military and civilian crisis, which has been a determining factor. The event is presented. A thorough diagnosis is made of the possible causes and a symbolic balance on the effects of the accident is finally worked out.

The work is also an occasion to commemorate 100 years from a sad episode for Romania - the occupation of Bucharest, but remarkable for Iasi, who played the role of capital of war under conditions of multiple crises but with remarkable determination and diplomacy, such as and an eulogy of the constructive Franco-Romanian cooperation.

W3C Plastics, Emotions and Consumer Society I

Location: H 14

Organisers: Maria Elvira Callapez, Günter Lattermann and Stefan Poser

Chair: Stefan Poser

Historic Surrogates (“Ersatzstoffe”) and the Image of Plastics Today

Dr. Günter Lattermann

In the 19th century, numerous natural polymeric materials were developed and used. This began with the vulcanisation of natural caoutchouc in 1839, led to elastic rubber and the first thermoset ‘hard rubber’, numerous daily life objects were made of. Later on, the first thermoplastic mass product shellac was patented, widely used as Florence, especially in USA. Then, the first telephone cable, isolated by thermoplastic gutta-percha, was installed. The thermoset Bois Durci allowed to fabricate splendid objects, including prestigious portrait medallions of all dynasties of Europe.

So far, these new polymeric materials were ‘childs’ of the beginning industrial age with not at all a bad, but a much-admired reputation.

In 1868, Celluloid started its extraordinary, longstanding career. With this first semi-synthetic product, mass production of a thermoplastics moulding material was realised on a very large scale, promoted among others by its unlimited colourability and realisation of patterns. Both allowed the imitation of e.g. ivory, tortoise shell, mother of pearl, coral, jade etc. on a large scale. Already at around 1910, those products were indicated as ‘taste aberrations’ during Art Nouveau. On the other hand, new, creative, beautiful, surpassing colour combinations and patterns, never reached again with younger plastics, were highly estimated.

In this period, the term ‘surrogate’, meaning the replacing of something expensive and rare by a cheap mass product (‘ersatz’), was not yet separated from the term ‘substitute’, indicating the replacement (German: ‘Ersetzung’) by a new, more suitable product with better properties.

During World War I, Germany had been isolated from imported materials. Surrogates (“Ersatzstoffe”) with often inferior properties became enforcedly widespread or were developed. Artificial honey (“Kunsthonig”), margarine (German: “Kunstbutter”, imitation butter), coffee surrogate, artificial silk (German: “Kunstseide”, with bad fabric properties) or the first synthetic rubber (“methyl caoutchouc”, with bad soft rubber properties) coined fundamentally the negative connotation also of plastics (German: “Kunststoff”). This was so traumatic that it became impregnated deeply in the collective memory.

In World War II, the situation was somewhat similar, so that the chemical industry produced artificial benzine, synthetic BUNA rubber, polystyrene etc. However, the product properties were much better, even often than their natural origins. Therefore, acceptance was better.

Nevertheless, until today the dichotomy of contrary opinions on plastics is still present. Recently, environmental challenges due to e.g. harmful additives, extensive use as packaging material, immense waste problems, exist. On the other hand, our daily life is not possible without the extraordinary properties of modern plastics: who would like to miss the smart phone, laptop, modern clothes, skis, airplane trips or even tooth fillings....?

Building the History of the Portuguese Plastic Industry through Material Testimonies

Dr. Inês Soares

Professor Susana Sá

Professor Joana Ferreira

The history of plastics began in the nineteenth century with the great development of the chemical industry and interest by novel materials. In Portugal, this history is still unwritten, and large amount of information still needs to be collected.

*Based on plastic objects, from private and industrial collections, the present work aims at studying them as material testimonies of the technical history of the Portuguese industry. Within the framework of the project *The Triumph of Bakelite - Contributions for a History of Plastics in Portugal*, questions like, which were the most important plastics? And, where were they applied? will be addressed. For that, objects reflecting the presence of plastics in the consumer's everyday life will be studied, drawing attention to the materials, formulation, manufacture and manufacturers.*

In Portugal, the plastics industry emerged in the 1930s, and in 1935 electrical components and equipment, lids, ashtrays, toys, combs, and domestic supplies made of bakelite were already available. With the end of World War II, new processing methods were introduced and Portugal assisted to the development of its industry with the introduction of thermoplastics, like PVC (poly(vinyl chloride)), PE (poly(ethylene)), PS (poly(styrene)) and PP (poly(propylene)). PVC was mainly used for plastic tubes, hoses, packaging, toys, shoes, etc. PE and PS were mostly applied to kitchen supplies, personal items and containers, and PP was used for domestic items and toys, with new colours and shapes.

Plastics also started to be used by industries such as the automobile, construction, food, agricultural, electrical, etc, invading every aspect of the everyday life. From that moment, they were no longer considered minor materials or seen as substitutes of old resources. Instead, through the offer of new colours, textures and varied forms at affordable prices, plastics started to enter people's lives without the consumer even realizing it.

Plastics Hand in Hand with Consumers

Dr. Maria Elvira Callapez

Graduate student Sara Marques da Cruz

Graduate student Marta Martins Neto

Plastics, synthetic materials of twentieth-century modernity represent a revolutionary landmark, in many aspects of our everyday lives. They are seen as the result of technological, scientific, industrial and engineering developments, thus playing an increasingly important and sophisticated role in areas such as medicine, electronics, aeronautics, automobile industry, food, construction industry, among others.

The strong relationship between plastics and the social, cultural, economic, aesthetic and industrial spheres has been visible. In spite of their initial acceptance, enthusiasm and popularity, these materials are generating feelings and emotions all over the world, crossing different people, economies and geographies.

After the Second World War, these new materials were remarkably adopted by the society consumption but in these days their image is undergoing a bad reputation, namely, associated with growing environmental impacts.

In this talk, we intend to analyse the role of plastics into the Portuguese society between the 1950s and 1990s, at a time under political, industrial and technological changes. On the other hand, we aim to explore how, and if, the consumers habits and attitudes influenced industrial production, namely, creating novel materials, new products design, or others.

As methodology we use, as primary resources, a collection of oral interviews made to plastic industry entrepreneurs, workers, plastics industry archives, national industrial associations and their annual reports, and press clippings. [1]

[1] In the scope of the research project ‘The Triumph of Bakelite - Contributions for a History of Plastics in Portugal’, Ref.: PTDC/IVC-HFC/5174/2014, funded by Fundação para a Ciência e a Tecnologia (FCT) - the Portuguese national funding agency for science, research and technology.

W3D Industrial Strategies from the Past to the Future

Location: H II

Organiser: PC

Chair: Lars Bluma

Two Centuries of Progress and Adaptation: The Evolution of the Société d'Encouragement pour l'Industrie Nationale

Dr. Andrew Butrica

There is no shortage of histories of the many provincial and Parisian scientific and technical societies. Whether of individual societies or prosopographical analyses of societies, these histories offer only a static image of these societies despite a changing social and political milieu.

I examine the Société d'Encouragement pour l'Industrie Nationale's history from its start in 1801 to the present to show its dynamic evolution over two centuries. Evolution responded to changes in the organization's leadership and in the social, economic, and political environment.

*The anticipated result is an understanding of how and why a major French institution evolved as well as how that evolution had an impact on the development of industry and agriculture over the *longue durée*, to borrow the phrase from the French Annales school (Braudel et al). A major goal is to construct a model that enables an understanding of how and why these transformations took place. The model and this paper examine the cohorts who took over the society at key times and redirected the society's efforts to make technology and science serve new purposes.*

Observed over two centuries, the Société d'Encouragement evolved from an extension of the Interior Ministry under Napoleon I to a self-proclaimed Academy of Applied Science and later (Third Republic) to a general engineering society which managed to escape extinction under the Vichy Regime and take on a new life. Despite seismic political and economic changes, the Société d'Encouragement continued to pursue its goal of improving industry and agriculture through the application of science (a concept which itself changed over time).

*The main sources for this project are the society's own archives and its periodicals, the *Bulletin*, which ceased publication in 1943, and *Industrie Nationale*.*

Industrial Strategy, Techno-nationalism and the Limits of Economic Liberalism under Thatcher

Ph.D. candidate Tom Kelsey

The Thatcher revolution is seen as one of economic liberalism, a rejection of the protectionism and interventionism once central to the political economy of the British state. This paper writes economic nationalism into the Thatcher governments by revealing their industrial strategy. In the early 1980s, Conservatives backed a domestic microelectronics industry for techno-nationalist reasons. More importantly, throughout Thatcher's premiership, the government consistently sought to maintain a powerful military-industrial complex in Britain and Europe. This militaristic techno-nationalism frustrated the economic liberalism of the British state, going against the advice of the Policy Unit and the Treasury who urged buying American machines. Economic liberals attached to think-tanks like the Institute of Economic Affairs also publicly criticised the techno-nationalism of successive post-war British governments – including those of Thatcher – for sustaining industrial lobbies and leading to state secrecy; criticisms that had more in common with the radical left than the practice of the Thatcher governments.

This paper makes little sense if historians understand the politics of the Thatcher era as the rise of 'neo-liberalism'. The concept obscures not only Thatcher's economic nationalism and its critics, but also masks critical questions about state power and economic nationalism in twentieth century British history. This paper also argues for the need for a conceptual reorientation for thinking about techno-nationalism. Often the term has been used to think through matters of national identity, but less commonly matters of economic strategy. Rarely have historians of technology gone inside of state archives to understand the importance of economic nationalism: the lure of building domestically designed machines and maintaining national industries. The fact that such techno-nationalism could survive even the free-market rigor of Mrs. Thatcher only serves to further highlight how historians of technology need to take economic nationalism seriously to grasp the relationship between states and machines in the twentieth century.

Economics and the Fourth Industrial Revolution: a History of the Future?

Professor Simone Fari

In 2016, the World Economic Forum (WEF) has organized its Annual Meeting about the Fourth Industrial Revolution. This meeting has been the arrival point of ten years-long academic and non-academic journey. In the last decade, many economists, scholars and international organization /association have written and discussed about the social, economic and political consequences generated by the

Fourth Industrial Revolution. These researches often consider technology as an exogenous factor and they neglect long-run perspective.

This paper is a critical review of economic literature about the Fourth Industrial Revolution. In particular, it considers the critical turn which took place between 2001 and 2009 financial crisis. Since then, economic literature has been incoherently skyrocketing. Two main approaches arose: 1) the techno-pessimist, subdivided among “negationists” and “Great Stagnation” supporters, and 2) the techno-optimist, subdivided in catastrophists, enthusiasts and “job polarization” supporters. Techno-pessimists think the Fourth Industrial Revolution doesn’t exist (negationists) or if it exists, it’s not important (great stagnation supporters). On the other hand, techno-optimists explain us that we are living the Fourth Industrial Revolution. Nevertheless, techno-optimists are divided between optimists and pessimists. The first group of scholars (enthusiasts) believes the effects of the Fourth Industrial Revolution will be positive: more jobs, more opportunities, less inequality. The second group believes the Fourth Industrial Revolution will lead us to the end of the world (catastrophists) or to a radical reduction of the job opportunities (job polarization supporter).

This article shows how economic literature about the Fourth Industrial Revolution lacks historical perspectives and it claims for wider use of this approach in further researches. Besides, the article also claims an active role of the historians in the elaboration and in the implementation of the economic policies for the future.

Future Expectations in the German Textile Industry: The Role of History on the Cusp of the 4th Industrial Revolution

Ph.D. candidate Robert Peters

I examine the role of past technological transformations for future expectations of the German textile industry and textile machinery industry. On the cusp of the 4th industrial revolution – also referred to as industry 4.0 – there is still uncertainty about some important questions: What does this technology-driven transformation really mean for society? How can manufacturer prepare themselves?

In my study, I discuss the role of experiences with past technological transformations for future expectations. My thesis is: The digital strategy of textile manufacturers and textile machinery manufacturers is influenced by historical experiences on how to manage technology-driven change.

First, the study based on a sample of more than 40 semi-structured in-depth interviews with CEOs of German textile manufacturers and textile machinery manufacturers with a focus on traditionally important textile industry clusters in Saxony and North Rhine Westphalia. The aim is to explore the background of strategic thoughts on how to manage technology-driven change in their business.

Second, the study analysis the historical development of the selected textile industry clusters from the first industrial revolution onwards. By applying the STEPLE Analysis (F. J. Aguilar, Scanning the Business Environment, New York City 1967; M. Granovetter, Economic Action and Social Structure: The Problem of Embeddedness, in: American Journal of Sociology Vol 91, No. 3, 1985, S. 481-510; R. Lynch, Corporate Strategy. New York 2003) and the multi-criteria impact analysis (introduced by the author: R. Peters, Labour Market Regulation and its Commercial and Economic Impact – A Preindustrial Case Study, WST Working Paper No. 2/2017), I examine mechanisms of reciprocal interdependency between technological change and economic as well as societal transformation. The historical analysis is based on historiographic literature and relevant sources (e.g. regional statistics, annual reports of the chambers of commerce).

To discuss the given thesis, I screen the interview-transcripts for both explicit and implicit references to historical experiences.

The study demonstrates, that strategic thoughts on how to manage the digital transformation are influenced by historical experiences. Certainly, the impact is rather unwittingly than wittingly.

W3E Technological Momentum: From Gunpowders to Modern Explosives and Propellants 2

Location: HR 5

Organiser: Brenda Buchanan, Yoel Bergman and Steven Walton

Chair: Steven Walton

An Early Industrial State-owned Enterprise: The Royal Gunpowder Mills Waltham Abbey 1787–1816

Ph.D. candidate Sabrina Fröhlich

The industrialization of Britain beginning in the 18th century affected the relationship between the state and economy enormously. Added to this was the state burden of ongoing Wars. This paper will address the relationship between the state and economy by asking how the connections between the Ministry Department Office of Ordnance, their state owned enterprise and the economy developed. This will be explained using the example of military goods, particularly the case of the Royal Gunpowder Mills Waltham Abbey between 1787 and 1816.

As an integral element of warfare, gunpowder and the production thereof provides a unique lens into the state-owned enterprise Waltham Abbey. The Office of Ordnance was responsible for supplying the armed forces with all their weaponry and gunpowder, but the production itself was contracted to state licensed private manufactures until 1757. When the Office decided to purchase the powder mills in Faversham in 1757, it was the first attempt to nationalise powder production but not the last. With the acquisition of Waltham Abbey in 1787, the Office concentrated on the actual demands of powder production and increasing its quality.

Current scholarship on the subject of gunpowder mills focus on technological development and production organisations, however, these perspectives have not adequately addressed the business history point of view. This paper investigates the relationship between Waltham Abbey and the economy, mainly private manufacturers, concerning the process of powder “standardizations”. The Office became less reliant on the private sector as it increased the state production. The consequences were norms and regulations imposed by Waltham Abbey from 1787 onwards. This paper examines these standards, which included improving the purity of the raw materials, structural changes in production methods, and proof tests.

Did Making Gunpowder Make Good Revolutionaries? Using Saltpeter to Measure Popular Support for the American Revolution
Dr. David Hsiung

During the American War of Independence (1775-1783), George Washington and the Continental Army never had an adequate supply of domestically produced gunpowder. The problem lay with a shortage of saltpeter (potassium nitrate), so the rebel governments and newspapers published instructions for civilians on how to boost saltpeter production. The degree to which Americans were willing to do this provides a new way to measure popular support for the revolutionary cause.

My previous work has examined these methods for making saltpeter by looking into the colonists’ understanding of chemistry and geology. Americans misunderstood saltpeter itself by thinking, for example, that it grew from living rocks buried underground. However, their methods for extracting and purifying the substance follow sound (according to modern science) procedures. Therefore, we must attribute the shortage of saltpeter not to their misunderstanding of nature, but to their tepid support for the Revolution. The Continental Congress’s patriotic appeals and monetary inducements never aroused enough Americans to action.

However, what about the relatively few individuals who did manufacture saltpeter and send it to the gunpowder mills? For the ICOHTEC Symposium, I

will use the extensive letters to and from Robert Treat Paine of Massachusetts to investigate his small community of producers. What technical challenges did they face, how did they overcome them, and to what degree did the revolutionary cause provide assistance and motivation? By integrating the day-to-day tasks of making saltpeter with the broader emotional, philosophical, and patriotic appeals to independence, this paper seeks to enhance our understanding of both topics.

W3F Reception of Novelties in Radio, Broadcasting and Communication

Location: H 26

Organiser: PC

Chair: Jan Hadlaw

Radio, Home, and Country: The Listener, the Medium, and the Network, 1922-1960

Professor Anne MacLennan

Radio entered the Canadian home, rapidly however, there were a variety of obstacles to overcome through manufacturing changes, audience expectations, and network expansion. The domestication of radio initially meant the device had to be made suitable for the home. Its appearance and function was altered. The early radio operators returned from the First World War ready to bring radio to their communities, but were met with some resistance. Listeners did not understand how the sounds and music could enter their home without the assistance of wires. Like phantoms and ghosts the entry of broadcasting into the home had to be explained and as the technology evolved, it became more palatable to the audience. This paper depends on interviews with surviving members of the radio audience during the 1930s, radio import and purchase data, newspapers, and archival research including the advertisements. The early Canadian and American radio manufacturers adapted their designs not only with respect to the early fears, fit in the home, but also technical improvements. Equally important to overcoming the fears and manufacturing challenges was the network itself. The national network finally blanketed most of the country in time for the Royal Tour of 1939, but conveniently prior to the Second World War, when radio became a crucial tool for following the progress of Canadian troops overseas. The high-power stations changed the balance of programming for the country, but provided service that was demanded by the Second World War and in the postwar period. The rapid change of the radio itself, the audience expectations, and the network delivery altered national connections and identity.

Dark Side of AMPEX
Mr. Roman Artemenko

Media technologies changed the world more than any single historical research can describe. During the end of XIX centuries it became clear – further development and success in application of technology lies in closer cooperation between different scientific, technological and social mediators. R&D labs became leaders of innovative technologies now – not a lonely inventor anymore.

Found in 1944 by Russian immigrant A. M. Poniatoff, AMPEX Corp. became an icon of a successful R&D company and dream job for a few generations of engineers. In this presentation I would like to discuss various applications for lesser-known AMPEX products (used for NASA, NAVY and other projects), which usually overshadowed by more famous public media related devices – audio and video tape recorders for broadcasting and sound recording studios and cinema sound systems, and wider questions, which rises during such research:

If it's possible today to get reliable sources to understand whole complexity of civil/military relations in history of communication technology; Will it be justifiable to say, that nature so-called “hybrid wars” lays within media technology as fundamental “isolation-communication” issue for a global domination; How it happened, that each new media provide basis for ultra-nationalism and tricky manipulators. Will it be possible to prevent such negative effects without further development of technology.

W3G New Approaches to Industrial Heritage

Location: E IIA

Organiser: PC

Chair: Michael Hascher

Visual Memories of the Marble Industry – Using Cinema and Photography in Mining Heritage Studies

Ph.D. candidate Armando Quintas

Ph.D. candidate Alexandre Ramos

*With the present communication will disclose the latest results from *Heritage and History of the Marbles Industry 's (PHIM)*, a project that is taking in southern part of Portugal. Therefore, will unveil the outcome of combining cinema and*

photography on a comparative study about Marble Industry in four countries: Belgium, Italy, Portugal and Spain.

*Marbles Industry in Portugal is mostly concentrated in Alentejo's region, more precisely in the *Anticlinal de Estremoz* area, one of the largest and most important marble mining cluster for ornamental purposes in the world. Although, mining is uninterruptedly active in Alentejo since Roman Empirical period, industrialization only took place in the 1920's when international companies (e.g. Luzo-Belgian Society of Mármores S.A.) where establish in the region.*

These companies introduced new techniques and technological equipment (e.g steam engines, helicoidal cut and large cranes), which lead to an exponential production increase and consecutively to a profound environmental and landscape transformations, as well social and economic changes.

These companies introduce technology that they were already using in other European regions, like in Walloon (Belgium) or Carrara (Italy), which confirms the standardization in the chain process. However, despite using the same technology, the local know-how and landscape features in each region created different working contexts, may of them undocumented in written sources. Indeed, moving images and iconographies prove to be a relevant source for studying local working techniques, machinery adaptations or distribution of work.

In short, with these sources we are also to update previous studies and produce new ones, such comparing mining techniques. Also, these images prove to a suitable and appealing didactic instrument to show, among others subject, how technology has been mutating to overcome market challenges and continue to explore the vast mineral deposits.

The Structural Rehabilitation of Tharsis Pier (Huelva, Spain):

Monument of the Spanish Industrial Heritage

Ph.D. candidate Aurora Donoso-Sequeiros

Dr. Narciso Vazquez-Carretero

*During Great Britain's Industrial Revolution, foreign capital settles in Huelva, Spain, attracted to its rich copper deposits. This fact unleashes substantial changes at an economic and sociocultural level; and paved the way for the Industrial Revolution in Andalucía. In this context, the iron piers of *The Tharsis Sulphur & Copper Company Ltd.* (1871/1921) and *The Rio Tinto Company Ltd.* (1876) at the Port of Huelva, being part of a new typology of railway wharf born in Great Britain, constitute excellent samples of the 19th century cutting-edge technology in Europe. As milestones of Spanish Industrial Heritage, in*

1997/2003 they are declared Cultural Interest Goods in the category of Monuments.

Despite the importance they have enjoyed, once their activity ceased at the end of the 20th century, both piers were abandoned, suffering a noticeable deterioration.

The aim of the research is to develop new procedures of intervention in Tharsis Pier, that leads to the ambient recovery of the monumental ensemble that it forms with Riotinto Pier. Given that it will be a structural rehabilitation, there is a first phase of geometric, material and constructive characterization of the asset; followed by a second main phase of structural analysis. The analysis is based on a global 3D model of the pier, that includes the previous characterization, and computed with a software for three-dimensional structures of bars in which elements follow a linear behaviour. The conclusions revolve around the capacity and structural need of the different elements; the characteristics of disused materials such as cast and wrought iron; or the validity of current regulations to deal with industrial heritage assets' rehabilitation, among others.

Based on the results, the research would offer the possibility to move from a specific intervention proposal to a standard methodology of intervention applicable to the whole set of British (or inspired by British) piers.

Photography and UNESCO Industrial Heritage World Heritage Sites of the Iberian Peninsula

Ms. Sheila Palomares Alarcón

Mr. Pietro Viscomi

At the present time we can find more and more industrialization goods inscribed on the World Heritage List. Nowadays fifty-three cultural goods have been counted (4.93% of the total of the sites) and four of them are located in the Iberian Peninsula: Luiz I Bridge, which was inscribed in conjunction with "Historic Centre of Oporto, Luiz I Bridge and Monastery of Serra do Pilar (1996)", "Alto Douro Vinhateiro (2001)", "Vizcaya Bridge (2006)" and "Heritage of Mercury: Almadén and Idrija (2012) "

*All of the mentioned works have been documented since their construction through photographs taken by recognized photographers as Emilio Biel, *Fotografia Alvão* or Ruiz Vernacci Archive (created by Jean Laurent); besides by amateur photographers as H.B (we only know its acronym. It photographed between 1913 and 1922 with stereoscopic plates both Luiz I Bridge and Vizcaya Bridge).*

*These images have become documentary tools of extraordinary value to develop this research. They have helped us to know the industrial heritage situation together with the documentary, bibliographic and archival sources, the field work and the analysis of the results *in situ*; because as the photographer Duccio Malagamba (2014) says, architecture can only be deeply known by visiting it.*

This communication aims to show the importance which had and have photographs to know and to show the extraordinary value industrial heritage inscribed on the World Heritage List of the Iberian Peninsula; so that we reflect on their values and on their future.

W3H Interaction of Modernisation, Technology and Agrarian Economies

Location: E IIB

Organiser: PC

Chair: Tiago Saraiva

The British-Raj and the Evolution of Modern Agriculture Science, Tools, Techniques and Knowledge in Bengal

Ph.D. candidate Pankoj Sarkar

In spite of agriculture being one of the key sources of revenue for the British Raj, the British authorities were not motivated to improve Indian agricultural techniques and practices on scientific lines until the middle of the nineteenth century. The process of penetration of new knowledge and techniques into Indian agricultural practices was a complex phenomenon. However, little scholarly work exists on the impact of technology on Indian agriculture in colonial India. One of the reasons for the lack of scholarly work in this area is that the aggregate official estimate of yield per acre used to measure technological change did not show any significant improvement. Thus, this study is intended to enquire into the complexities to the development, dissemination and adaptation of modern agricultural tools, inputs, methods in Indian agriculture from the perspective of science and technology and society (STS) to include a holistic understanding to the development of technology rather than simple focussing on agricultural productivity and production aspects.

Based primarily on the analysis of vernacular (Bengali) archival sources, the paper brings out the perspective of the colonised. The field of (STS), has largely made use of archival sources in English when studying Colonial India. The paper seeks to bridge this gap in STS by using both vernacular and English language archives in order to arrive at a richer and more nuanced understanding of modern scientific knowledge and its circulation in colonial settings. This research finds that in many occasions, the process of technological development, its dissemination and adaptation in agriculture in colonial Bengal was influenced by its utility, societal, cultural and ecological factors. These factors in one way or the other had a repercussion on scientific community, research, bureaucratic decision and knowledge building/negotiations process.

Keywords-*History of Science, History of Technology, Agriculture, Colonialism, Vernacular Writing, Periodical, Archive*

Thursday, 19 July

09:00—10:30

FIA Technical Democracy: What are its Antecedents and its Prospects? I (In French)

Location: H 21

Organiser: Pierre Lamard, Mathieu Tricot and Yves-Claude Lequin

Chair: Pierre Lamard

Commentator: Yves-Claude Lequin

100 Years of Projects for Home Automation: the Figure of the Kitchen
Ph.D. candidate Noémie Boeglin

*Novels of Albert Robida belong to the type of anticipation. In *Le Vingtième Siècle* (1883) and *La Vie électrique* (1892), he imagines an anticipated city of Paris in the 1950s. Robida is not only the author of the texts but also of the illustrations in his books. Caricaturist and drawer, he conceives all the dimensions of his fictional world. Beyond constructive methods, themselves innovative, we were interested in the figure of the kitchen. His electric houses are connected to central kitchens: meals arrive at home, ready to be eat, delivered by a network of pipes. The subscribers of the *Compagnie nouvelle d'alimentation* or one of the other five companies are not immunized against an incident. One of his characters believes that installing a kitchen in his home is good for "insubordinate to progress". Automatic kitchen at home is an idea that runs through the years. In 1806, Jean-Frédéric de Chabannes proposes a project for the construction of entirely automatic houses. A contemporary of Robida, Louis-Prat-Noilly constitutes the domain of the *Château d'Avignon*, near Arles, strongly inspired by hygienist theories. His kitchen is equipped with the most modern techniques. In 1907, Georgia Knap opens his electric house or *Villa Feria Electra* to reporters. In the basement of the house there is a kitchen entirely equipped with electrical household appliances. Prat, Robida and Knap, with their project proposal, fictional proposal or executed proposal, give us to see hundred years of imagination and innovation in the kitchen space. Electricity, water and hygiene are at the center of the various installations, imagined or real.*

***Culinary Technical Gestures and Domestic Rationalization:
The Art of Managing Everyday Life***
Dr. Aurélie Brayet

Since the nineteenth century, the daily actions of women have been profoundly modified by societal changes (schooling, hygiene, rising standard of living or geographical mobility) but also especially by the industrial production of objects and the mechanization of tasks. Everyday life: Muscular energy has been gradually replaced by mechanical and electrical energy. The household gesture, like the one that kneads dough or mashes potatoes is a household technical gesture. A technical gesture has a practical and useful purpose. It aims complete the task for the sake of efficiency. Nevertheless, this gesture is also a ritual, almost magical, that sometimes resists science and is passed on against any scientific reason. From household practices to daily gestures and "tricks of the hand", these highly feminine body movements have seen new invasions between women's bodies and action, new artifacts. The relationship of users to these gesticulating objects is complex. While some theorists of home economics have devised a "household gymnastics" to "adapt" women's bodies to these devices, the search for the perfect gesture in the kitchen marked the movement of domestic science. These theories show, indeed, through a scientific and rational approach an analysis of each culinary gesture like the experiences of the Gilbreth family (Franck and Lillian) or through the works of Christine Frederick, Edouard de Pomiane and Paulette Bernège who wished to standardize, to rationalize, scienticize and taylorize the kitchen. It will be in the context of this study to propose an analysis of the rational thought applied in cooking.

La conférence des directeurs » or the Tool according to Henri Fayol to Scientifically Lead a Big Company, 1888-1918

Dr. Luc Rojas

The writings on Henri Fayol has been developing for several years. These writings use many sources. But these writings never use the archives kept in the Departmental Archives of Nièvre. This repository keeps the minutes of the "conférences des directeurs". This management practice was put into practice by Fayol in 1888, when he was appointed managing director of the limited company Commentry, Fourchambault and Decazeville. This paper proposes to analyze these sometimes unpublished documents. These documents will reveal a practice that wants to be close to the field. But also a system that aims to adapt a scientific reasoning to the management of a big company. This communication will also propose a statistical analysis of this practice. This should show a practice open to all members of the company. In addition to the directors of mines and factories, other employees are invited to present their experience at these meetings. Thus it is not uncommon that engineers, technicians, salespeople or others to participate. A study and a contextualization of these management practices will be proposed at different scales. Indeed, it is necessary to put in perspective this practice with the time but also of the doctrine of Henri Fayol which is at this moment there in development. Sources: AD58: fonds de la société anonyme de Commentry, Fourchambault et Decazeville (106 J) Sciences-po Paris : fonds Henri Fayol Les nombreuses publications d'Henri Fayol

TiB West - East Transfer of Technology during the Cold War

Location: H 13

Organiser: Timo Myllyntaus

Chair: Timo Myllyntaus

The Tight Rope over the Iron Curtain: Technology Transfer between Finland and the Soviet Union during the Cold War

Professor Timo Myllyntaus

The Cold War period (1947 – 1989) was a transition from wartime constellations open armed confrontations to peacetime veiled tensions. Circumstances during the Cold War were strained but without open military conflicts between the two big political blocks. Although these years have been described as a period of icy relations between East and West, the period, nevertheless, had another – cooperative – side. Under the epithet “peaceful co-existence”, various kinds of technology was exchanged across the “Iron Curtain.”

The transfer of technology tends to be the more complex and challenging process, the more different are political and economic systems and cultures between the supplier and the recipient. Therefore, circumstances of technology transfer between West and East during the Cold War were exceptionally difficult because politics was closely intervening in the business relations. Exporting and importing were controlled in West and East by both business enterprises and governments. One might wonder whether exchanged goods were chosen on political or commercial grounds. Classical examples were that in the 1960s and 1970s, the Soviet Union did not allow to import jeans or women’s tights from West, whereas western countries refused to export high tech, such as microchips and computers to the Soviet Union. In principle, the control to obey trade regulations was tight and even ordinary customers were demanded to follow the restrictions.

During the Cold War, socialist countries imported a considerable amount of western products emphasizing commodities what they lacked or supplemented the assortment of their domestic supply. These products often were somehow different from western companies shipped to other markets. This article aims to analyze how products were selected, engineered and designed for the West-East trade between 1947 and 1989. A research hypothesis is that the strained political relations – the Iron Curtain – modified the West-East trade as well as the transfer of technological change.

In general, the political frameworks of both supplier and recipient countries always influence on the trade relations and technology transfer, while cultural factors have some impact on them as well. This paper focuses to study how the Iron Curtain affected to technology transfer and foreign trade between Finland and the Soviet Union during the Cold War.

Duplication Model of Transfer of Western Technologies in Soviet Metallurgy, 1920-1940

Ph.D. candidate Irina Sheveleva

The main channels of transfer of Western technologies to Soviet Russia have undergone several stages: concessions, technical assistance through licensing agreements, and duplication (as a rule without license agreements).

The practice of foreign companies' work in Russia in the late 1920s was dominated by concessions. These companies were directly involved in business activities and they were the main source of Western technologies.

In the 1930s, the concession practice gave way to the technical assistance agreements, in particular in Russian metallurgy. By this time, the German model of industrial organization with its emphasis on electrical and chemical industries had been delegitimized in the eyes of Soviet policy makers and substituted by the American model with the leading role of mining, metallurgy, and machine building. Iron and steel plants reconstructions were made under the supervision of American and German engineers (Henry J. Freyn of Chicago and Albert Kahn). The American firms' activities fell into four categories: consultation, projecting plans, furnishing detailed drawings, supervising construction and all equipment supply from foreign countries. For instance, more than 800 foreign specialists from the USA, Germany, England, Italy and Austria worked under the leadership of the Americans on the construction of the famous Magnitogorsk Metallurgical Combine.

By 1940, USSR could produce more or less efficient duplicates of all equipment related to iron and steel plants. The duplication model had been adopted on the institutional level. One of the steps in this direction consisted in the reform of the Law on Invention (1931) that encouraged "plagiarism" and use of inventions already described in foreign literature and seen in foreign practice.

In this light, there are two major questions that need answering: Was the institutional consolidation of this duplication model of appropriation of Western technologies a point of no return to innovation development in the USSR? How did this model affect the development of Russian metallurgy in the 1930-1940s?

As a matter of priority, the author worked with archive collections of the State Archive of the Russian Federation (SARF), the State Archive of Economy of the Russian Federation (SAERF), the Archive Academy of Sciences of the Russian Federation, and Saint Petersburg Central Archive of Scientific, Technical and Technological Documents.

Soviet Bureaucracy and the Postwar Technological Transfer at the Soviet Periphery, 1944-1947

Researcher Alexandru Lesanu

After the capitulation of Nazi Germany, the Soviets asked for war reparations and removed thousands of factories from Germany to the Soviet Union. This postwar technological transfer was an important test for the Soviet bureaucracy, since before displacing the German factories, the Soviet authorities had to decide how to distribute them throughout the different Soviet regions. How to decide which factory to transfer and if it would fit in the new place? Who had the most important role in the Soviet postwar technological transfer?

In spite of the central authorities in Moscow, who drew precise plans on the distribution of the German factories to each corner of the Soviet Union, the representatives of different Soviet republics had a crucial role in the attribution of the German factories. After World War II, numerous Soviet delegations roamed through the German territory searching to remove the appropriate factories to their regions. My paper traces how the Soviet authorities on different levels of Soviet bureaucracy decided to remove a German sugar factory to the peripheral town of Rybnitsa, in Soviet Moldavia.

Initially, the Soviets planned the displacement of Anklam Sugar Factory from Western Pomerania to Rybnitsa, but a delegation of specialists from the Rybnitsa Sugar Factory arrived to Anklam only to notice that most of the factory's equipment was old and some of it perished in the war. Consequently, they persuaded the central authorities in Moscow to approve the relocation of Zörbig Sugar Factory from Saxony-Anhalt. In contrast with the Anklam Sugar Factory, the factory from Zörbig was fully mechanized and electrified. Still, the mechanized factory was less adapted to the predominantly manually operated infrastructure of sugar production in Rybnitsa. This case of technological transfer clearly contradicts the assumption that local authorities are more competent about the local matters than the center.

Home Technologies and the Question of Technological Drive in State Socialism

Dr. Patryk Wasiak

With this paper I investigate discursive strategies of key social actors who took part in public debates on the technological drive in state socialism. Here I bring the case-study of state socialist Poland of the 1970s and 1980s and focus on debates related to the dissemination of consumer-grade electronic technologies (color TV sets, stereos, VCRs and home computers) and possible impact of technology on the development of society as the Marxist "base".

I investigate how key social actors: policy makers, economists, industrial managers and electric engineering community situated further development of such technologies in the framework of Marxist interpretation of technology as a value-neutral force which can drive further development of socialist society. I argue that the focal point of the debate was the question if home technologies that are the results of the ongoing techno-scientific revolution in electronic technologies are value-neutral. Here I investigate the controversy over the question if home technologies which are the results the ongoing techno-scientific revolution in the West can be interpreted as value-neutral or if they are somehow intrinsically inscribed with the “capitalist definition of technology”.

While discussing this case-study I refer to the state of the art of the studies on social construction of technology in the Soviet Bloc (Augustine, 2007; Josephson, 2010; Stokes, 2000). My source base includes records of governmental agencies, research reports made by state research institutes and content of technological press.

References:

*Augustine, Dolores L., **Red Prometheus: Engineering and Dictatorship in East Germany,***

1945–1990 (Cambridge and London: MIT Press, 2007).

*Josephson, Paul R., **Would Trotsky Wear a Bluetooth? Technological Utopianism under Socialism,***

1917–1989 (Baltimore: The Johns Hopkins University Press, 2010).

*Stokes, Raymond G., **Constructing Socialism. Technology and Change in East Germany 1945-1990** (Baltimore et al.: The Johns Hopkins University Press, 2000).*

TIC Plastics, Emotions and Consumer Society 2

Location: H 14

Organisers: Maria Elvira Callapez, Günter Lattermann and Stefan Poser

Chair: Maria Elvira Callapez

Plastics, Emotions, and the Oil Crises in the 1970s

Dr. Stefan Poser

Synthetic polymeric materials and their precursors generated quite different feelings and opinions from their first onset. On the one hand, they were often recognized as cheap mass products, partially replacing valuable or rare materials ('Ersatzstoffe'). On the other hand, they took over a fundamental role as promoters

of technical developments and became key-materials of the emerging consumer societies in the post war period. Thus they were prized e.g. by announcing the *century of synthetic materials* in the 1950s. Whereas associating plastics with 'progress' might have been the dominating point of view until the 1970s, this changed after the oil crisis. Environmental concerns gained more influence in Western European societies. *'Jute instead of plastics'* became a well-known slogan of the environmental movement in Germany.

What are the reasons for this shift of the public opinion? Why did plastics gain an important role in the environmental discussion, although heating of oil has a higher ecological impact and means – compared to the production of plastics - wasting a raw material? Why did the reputation of plastics change again in the 1990s? There is still a lack of research concerning these developments. The author will analyze the discourse on plastics mainly based on sources from Germany. In doing so, he aims to contribute to the investigation of public acceptance of technology and technology-based materials.

Summertime, and the Living is Plastic: PVC and the Creation of a Summer Toy Industry

Ph.D. candidate Angela Cope

There are few things that embody Daniel Miller's theory of "the humility of things" (1987) as completely as small, plastic toys. It is an odd proposition to realize that plastic usage in toys is written off despite its present ubiquity (one would be hard pressed to find a toy without some components of plastic on the shelves of a major retailer), early adoption of the material (amongst the earliest examples of both semi-synthetic and fully synthetic uses were toys. The "original" creation of cellulose nitrate was to replace the use of ivory in billiard balls in the 1850s) and its relatively large role in the explosive years of growth the industry experienced post war.

Polyvinyl Chloride, or PVC for short, is one of the more contentious plastics, its manufacture being linked to the mercury poisoning that caused the Minamata disease in 1959, and a rare liver cancer cluster amongst employees of American vinyl chloride factories in 1974. More recently, plasticizers to make PVC pliable have been implicated in endocrine disruption in the general population and skewed birth ratios in highly exposed subsets. Yet, PVC continues to be ubiquitous in toy manufacture, particularly in low cost vinyl inflatables for summer use. This paper will trace the rise of vinyl inflatables and their contribution to the creation of a summer toy industry. The summer toy industry is unique to the postwar consumer republic, as the suburbanization and "backyardification" of play lent itself to the proliferation of above ground play pools and the toys to go with it. These toys are a direct result of a war industry focused on the creation of inflatable life boats and preservers, and have uniquely shaped the way that consumers participate in summer activities. One begins to wonder if indeed

childhood were not so readily plasticized, that the acceptance of plastic in adulthood would be so complete and unquestioning. While questions of causality are by no means answerable in this case, I wish instead to tell one story of how plastic – in particular, polyvinyl chloride - became so ubiquitous in childhood.

W8FI-6 Plastics - Friend or enemy of humans? Case Study for Romania

Dr. Laura-Mihaela Lelutiu

Dr. Elena Helerea

Over time, plastics have created many controversies and opinions. The recent publications regarding plastics have been centered mostly on environmental concerns and human health. The press highlights the influence of repeated recycling of plastics on their properties and their environmental implications. On the one hand, plastics have always been in the public eye for potentially hazardous exposure to toxic components as well as environmental damage through their use, more precisely because of persistence of plastics in the environment. Therefore, it is a fact that the issue of plastic waste is obvious and problematic and demands action. However, on the other hand, it can definitely say that over the past century, the most advances of human society have been facilitated by the use of plastics, and their beneficial impact on society is undeniable. At present, the modern world can not be imagined without plastics and rubber. The development of a country's industry depends directly on these materials, so the economic evolution of a country can be traced according to the consumption and annual production of plastics.

The paper focuses on the advantages and disadvantages of plastic materials, analyzing the case of Romania. The situation of the Romanian plastics industry in European context is also analyzed. The documentation sources are specialized journals and popular newspapers, such as: “Plastic Materials”, “Știință și Tehnică” Romanian magazines, collections of newspapers and almanacs.

The paper highlights the plastics benefits: the strengthening of the economy and the increasing of the number of jobs. Romania has been and is a traditional producer of plastics and plastic products in Central and Eastern Europe but not a significant exporter, with high production costs resulting in reduced competitiveness of the export products in relation to external competition. However, there are many other challenges to make plastics a friend of humanity.

T1D Manufacturing Industries, Management and Entrepreneurship

Location: H II

Organiser: PC

Chair: Andrew Butrica

Technical Innovation as a Solution to Political and Economical Crisis: The Example of the Early Industrial Complex of the Shūsekan jigyō in Japan
Ph.D. candidate Céline Zuretti

Can technology be an effective response to an economic and political crisis is a question worth asking when studying the Early industrial complex of the Satsuma Domain in the south of Japan in the middle of the 19th century.

The Chinese defeat in the Opium War affected the imagination of the Japanese with fear of the colonial thrust in East Asia. This is further reinforced by the arrival of foreign vessels calling for the opening of ports. Japan feels threatened and knows itself in a situation of technical inferiority when military power is at stake.

While the central government adopts a conservative position that precipitates an internal political crisis, some domains, such as Satsuma, ruled by SHIMAZU Nariakira, choose rather independently to experiment with innovative measures to deal with this new situation.

I show how with a strong base on an ambitious project of industrial western style complex, the Lord of Satsuma, facing an inherited economic crisis and having strong beliefs concerning the need to learn from and to be open to the Western culture and sciences, opts for risk-taking and openness. He develops a policy of wide scale innovation to generate both a military defense ability and also a development of industries to create wealth for the domain and its people. This policy affects a number of persons involved in the project but also influence the educational system orientated towards foreign language and applied sciences and economic prospects of this domain. I also argue how the lord of Satsuma uses this complex to demonstrate the value of his ideals outside the limits of his domain, on the political chessboard of the country.

The German Electrical Industry and the End of the Electric Car in Germany before World War I - The Example of the Automobile Company NAG in Berlin - Technological Development and Entrepreneurial Decisions
Researcher Thomas Irmer

The development of the electric car has received a new boost. It appears to be an answer to challenges of climate policy, the exhaustion of resources and new demands on urban mobility. Crises of other drives such as of the diesel engines are intensifying the trend towards electric vehicles, at least in Germany. One prognosis is chasing the other, and only recently, for example, a well-known bank estimated that one billion electric cars could be sold worldwide within the next 30

years. Automotive companies give the impression that it is only a matter of time until major technical disadvantages of the electric drive, such as battery power, will be overcome.

In my contribution, I want to focus on the early history of the electric drives by examining the reasons why the founding era of the electric car in Germany came to a standstill before the First World War. What was the role of technological, political and of economic questions? These questions will be discussed taking the history of „Neue Automobil-Gesellschaft“ (NAG) from Berlin as an example. Prior to World War I, NAG played a leading role in the German electric car manufacturing industry, as well as in the series production of cars in Germany. Reconstructing the history of the NAG is confronted with the problem of poor source records. This contribution is therefore mainly based on an analysis of secondary literature. In my presentation I argue that it is important to also reflect on the policy of the parent company of NAG, the „Allgemeine Elektrizitäts-Gesellschaft“ (AEG). The electrical and not the automotive industry was a key player in the German electric car industry. The leaders of AEG believed in mass motorization by electric cars, but history of the automobile took a different direction.

TiE 13th Annual Symposium of the Social History of Military Technology I

Location: HR 5

Organiser: Bart Hacker

Chair: Ciro Paoletti

Catapults still are not Atomic Bombs: Why does Technological Determinism continue to enthrall Military Historians?

Professor Kelly DeVries

*No, I did not think my article, “Catapults Are Not Atomic Bombs: Towards a Redefinition of 'Effectiveness' in Premodern Military Technology,” published in *War in History* in 1997, would be the definitive word on historians using technology to define premodern military success and defeat. In the wake of the 600th anniversary of the battle of Agincourt, two years ago, the story of the battle was told and retold. Not always was it the same – sometimes the heavy armor fatiguing the French knights was included with the invincibility of the English longbow – but technology almost always determined English victory and French defeat. Leadership, men and terrain were relegated to the background: someone had to use and command the use of the armor and longbows. This has been repeated elsewhere: an eminent historian who has recently written a book on the history of global war dismayed because the Ottomans were still building fortifications using straight “medieval” walls into the 18th century instead of “trace italienne” structures; another military historian suggesting in an upcoming article that gunpowder weapons grew geometrically more powerful as the guns*

themselves grew in size, ignoring that guns did not just grow larger, but also smaller. On both of these occasions, and many others, it is easy to focus on technology as the determinant of premodern conflicts. But in doing so these historians have ignored the most obvious evidence and common sense. This paper will advocate that when evidence and common sense conflicts with theory, theory should be abandoned. Men, leaders and terrain, in most cases, should outweigh technology in explaining success or failure in premodern military history.

“Neither Catapults nor Atomic Bombs”: Technological Determinism and Military History from a Post-Industrial Revolution Perspective Professor David Zimmerman

Kelly Devries in “Catapults are not atomic bombs,” and in fact, of almost all of those who have joined the fray to once and for all, kill off simplistic technological determinism, may have thrown out the baby with the bathwater. one aspect that linking most of these anti-determinists is their temporal focus, which is almost exclusively pre-industrial revolution; furthermore their views of the importance (or more accurately, the lack thereof) of technology in war is one that does not apply to the world since the mid-19th century. This paper will argue that technological determinism is not a disease of bad historical writing, but something that must be carefully applied in studying the technological systems of armed forces, regardless of time periods or geographic locations. i will argue that we need to apply a definition of determinacy that is related to the systems theory of French writer Jacques Ellul. I will provide post-industrial revolution examples of military systems and then apply this approach to the pre-modern period. The systems approach moves us away from the radical assumptions of earlier determinists. Technology is only one of the many determinant factors that influence battles, campaigns, and wars. The study of military technology, however, is central to any study of war, and we must not be afraid to move beyond the merely descriptive approach which appears to be promoted by the anti-determinists.

From the Military Revolution to Rmas: Technology, Military Institutions, and Society

Dr. Bart Hacker

The concept of an early modern military revolution was propounded by Michael Roberts more than six decades ago. Although Roberts addressed military efforts to assimilate gunpowder weapons from the mid-16th to the mid-17th century, his larger point has often been missed in expanding discussions of its implied technological determinism, or whether the revolution began earlier or took place later, or exactly which army deserves the major credit, or whether there was a revolution at all. But the larger point is both simple and profound. Even relatively small technical changes in weapons or other military technology may lead to very large social changes, as militaries reorganize themselves to assimilate and domesticate new technology and polities reshape themselves to support and deploy

the new military formations. This aspect of the term “military revolution” is obscured by the subsequent derivative coinage, “revolutions in military affairs.” Although used by historians with some success, the concept is fundamentally forward-looking rather than historical and focused almost exclusively on attempts by social scientists, much of it in professional military journals, to assess the consequences of technological change within the armed forces. A moment’s reflection, however, should make it obvious that military revolutions are a normal consequence of the central role of military institutions in complex societies. They have everywhere occurred regularly, if infrequently; they are scarcely limited to Western Europe, or even to the modern world.

TiF Technological Education and Exchange of Knowledge

Location: E IIA

Organiser: PC

Chair: Simone Fari

Instruments of Development: Indo-German Scientific Collaboration and Engineering Practices at IIT Madras

Professor Roland Wittje

This paper aims to explore Indo-German scientific and technological collaboration during the Cold War by looking at the history of the Indian Institute of Technology (IIT) Madras. IIT Madras was founded and set up between 1959 and 1974 with the assistance of the Federal Republic of (West) Germany during an evolving development discourse. The history of the Indian Institutes of Technology has so far been understood as the import of an MIT-type institution into post-independent Nehruvian India that facilitated outsourcing and the rise of the Indian IT industry. The history of IIT Madras, however, reveals a different and more complex story. As part of the Indo-German agreement, a number of German experts joined IIT Madras as professors for the initial years to set up laboratories and engineering curricula, to supervise students and research scholars, and to establish a corresponding research agenda. A first generation of Indian faculty in return received their training in Germany. German ideas and practices of engineering education and research are manifested and materialised in laboratory setups and large amounts of German scientific equipment.

How did the German professors think Indian engineers should be trained? How did German conceptions correspond to viewpoints and expectations of their Indian counterparts? How did Indian students, faculty and others experience the first decades of Indo-German collaboration? How did ideas and practices of engineering education and research unfold and transform in the Indian, or we might rather say in the Madras environment? I will trace the first generation of German experts, laboratory equipment and practices at IIT Madras and place them within concepts and practices of science and engineering education and research.

The Harpist Clotilde Cerdà and the Promotion of Technical Education for Women in Barcelona, 1885

Dr. Antoni Roca-Rosell

*Clotilde Cerdà i Bosch (Barcelona, 1861- Santa Cruz de Tenerife 1926) was the youngest daughter of Ildefons Cerdà and Clotilde Bosch. Ildefons Cerdà (1815-1876) was a prominent Spanish civil engineer, the author of the reform of Barcelona (1859) and a pioneer of the theory urban planning. Clotilde grew with her mother that was convinced that she was talented for art. Clotilde became a harpist, adopting the artistic nickname of *Esmeralda Cervantes*. Her debut was in Vienna in 1873, during the World Exhibition. She had a great success and toured around the world making performances in the main auditoriums. In addition, Clotilde was progressively involved in charity actions, such as the refusal of slavery or the movement against the death penalty.*

After some years in Paris, in the 1880s Clotilde lived in Madrid and in Barcelona. One of her initiatives was the promotion of women education. In 1885, she managed to set up in Barcelona an Academy of sciences, arts and crafts of the women. The institution suffered from a lack of support and finally was closed in 1887. This experience represents an early attempt of scientific and technical education for women in Spain. The Academy offered a variety of learnings, including feminine activities such as teaching or dressmaking, but also an “Industrial Section”. The scarcity of information does not permit to have a definitive vision of the experience, but it is clear that this academy played an important role in the promotion of women in technical activities.

The trajectory of Clotilde Cerdà is now better known thanks to the “Album” of personal documents bought by the Biblioteca Nacional de Catalunya recently. Taking advantage of this material, Isabel Segura has published in 2013 a new biography that opens new insights.

The Role of Military School in the Development of Italian Technology during the 19th Century

Ph.D. candidate Elena Rinaldi

During the nineteenth century, before the birth of polytechnics and with the closure of some universities by the governments of the pre-unification Italian states, much of the teaching and scientific research took place in the military schools. On the occasion of the scientific congresses, in particular of the Italian Congress of Scientists that took place in Turin in 1840, some prototypes and studies on new technologies were presented. The need for machinery to excavate tunnels in the mountains led some scientists and military to relate numerous steam engine designs and to decide whether or not to finance the projects.

What was the role of military academies in this period in the development of new Italian technologies? The presentation aims to describe an archive research conducted in recent years showing the involvement of some prominent figures of politics and science of those years, who came from military academies, in the decisions on technological developments in nineteenth-century Italy. On the one hand studies on prototypes of machinery to excavate tunnels in the mountains have led to theoretical research on steam, on the other hand the need to build new bridges and roads after the Unification of Italy led to research on the course of water and on the morphology of the land.

Analyzing the archive documents of the funds kept at:

- *“Accademia di Scienze, Lettere e Arti” (Modena)*
- *“Biblioteca Reale” (Turin)*
- *“Accademia Militare” (Turin)*

It was possible to reconstruct the reports of the proposed machinery projects for the development of the railways, tunnels, bridges and roads of post-unification Italy by managers from the military academies.

TIG Human Impacts on Nature and Landscape

Location: E IIB

Organiser: PC

Chair: Harro Maat

Silk Industry of Moscow Facing The Pollution of the Environment, Second Half of the 19th Century – Beginning of the 20th Century (In French)
Mrs. Olga Melnichenko

*This paper is a part of my Ph.D. thesis entitled, **The French Entrepreneurs in the Silk Industry of Moscow and Moscow Province (The Second Half of the 19th - the Beginning of the 20th Century).***

Flaws in the legislation on the issue of control over emissions of industrial wastes provided manufacturers with relative freedom of action, which, by the end of the XIX century, caused significant pollution of the main waterways of the industrial capital of Russia: the Moscow River and Yauza River. Since the 1880's, the city's sanitary authorities tightened the requirements for industrial wastewaters and ordered owners to equip their factories with a system of filters for waste treatment. Particular attention was paid to the most "harmful" industries, such as dyeing shops of textile factories.

Focusing on the silk-processing factories, this paper explores how, over time, the requirements issued by the authorities changed; how the interactions between manufacturers and controlling organizations progressed as a technical means for cleaning liquid waste improved according to the required standards.

This research is based on an analysis of documents from the Moscow Central Archive, specifically concerning the following factories: «Giraud & Sons», «Partnership of Silk Manufacture in Moscow», «Simonod & Co», «Society of Spinning Cocoon Waste», and the Moscow Governor's Fund.

The trials between the Moscow government and the manufacturers could last between two months and two years and showed, firstly, new demands of the government on health standards, secondly, the growth of the sense of responsibility of public servants, finally, the growing awareness of entrepreneurs and their willingness to spend money on the construction of wastewater treatment plants. These studies are particularly relevant, since the subject of environmental pollution and the interaction of producers and authorities remains very important nowadays.

Industrialization of Slovakia and its Impact on the Environment during the Period of Socialism

Professor Ľudovít Hallon

Ph.D. candidate Michal Ďurčo

Dr. Miroslav Sabol

*In the 1945, the territory of the current Slovak republic became an integral part of the restored Czechoslovakia, as its economically less developed eastern component. At the same time, Slovak backward economy (in comparison with its Czech counterpart) had to be included in the state directed socialist industrialization with the severe impact on the environment. This period saw the beginning of the development of several industrial fields with the major ecological impact, typical for the Slovak economy, such as the cellulose-paper industry in Central Slovakia with immediate waste discharge into rivers, cement and lime production with liquidation of the part of mountain massifs, chemical manufacturing. The environmental bearing of the economic development was absolutely marginally interesting until the mid-1950s. More eminent ecological structures serving the purpose of protecting underground waters by means of a system of wells for their withdrawal started to be built at the end of the 1960s. Ecological reasoning of the Slovak public, and gradually in governmental structures as well, started to be formed during the 1960s. A systematic approach to nature and country protection started during the 1970s under the influence of the worldwide development, the boom of ecological movements and partly also as a result of pressure from the domestic public. At the level of the Slovak government and ministries the years 1972 – 1974 saw the elaboration of a wider programme of environmental protection and development, approved under the title *Summarised concept of**

environmental care in SSR for the sixth five year plan (1976 – 1980). The preparation of this document also saw creation of analyses with the above mentioned data about the impact of industrialism on nature, countryside and quality of life.

Revisiting Wars against Nature: Irrigation Works in Nantong County, 1950s-1970s

Lecturer Yu Qiao

The existing historical literature has overemphasized the negative social, economic and ecological effects of political movements in the 1950s to 1970s since the founding of the People's Republic of China. Their arguments were highly politicized. The real stories are more complex than “wars against nature”. Nantong County is located in the southeast of China's, Jiangsu Province. Although the rain is abundant there, it is the unevenly distributed spatially and temporally. There is serious shortage of water in crop growing seasons. Local farmers seldom draws water from Yangtze River due to technical barriers and has maintained a slow development of agricultural production for two thousand years.

From 1958 the local government of Nantong launched a series of hydraulic works, containing head works construction, irrigation cannel dredging, electrification of water pumping etc. These projects were more than part of the localization of nationwide political movements including the Great Leap Forward Movement and Learning from Dazhai in Agriculture. Irrigation projects have supported one of the major agricultural reforms in the region: changing dry land to paddy field. And it eventually makes the annual double-crop rotation system (wheat and rice) possible which has been stable till nowadays. Millions of provincial labors took parts in the seasonal construction of the irrigation works. Their industrial operations and everyday life in Nantong interacted with local ecology in multiple dimensions and made unexpected results.

Does Technology Shape under the Pressures of Farmers or Shaping Farmers under the Pressure of Technology? (In Spanish)

Ph.D. candidate Bruno Esperante Paramos

The aim of this paper is discuss around the central question between ideology and technological change. We will try to analyse it in the historical context of the post-war years in Spain 1939-1950. The forties in Spain is defined particularity due construction of the fascist Franco Regime as a result of the Spanish Civil War (1936-1939). For other hand at the international level, because the acceleration of the third wave of technological change with the Second World War (1939-1945).

In this sense, we will analyse the transformations of the Spanish innovation system between the past decade of the thirties and the new technological lines defined by a more totalitarian approach of the state action over the "modernization" in agriculture. Our micro case of study will be through the action of the state, the market and society using mainly state legislation, but also other sources like tractor companies documentation, historical newspaper libraries and moreover private correspondence of different protagonists and state technicians. Every historical source will be used to know the changes in the definition of technological change in the forties, especially focused in the analysis of the transition from oxen to tractors. Thus, we hope to discuss and obtain concrete conclusions through historical examples about the state, the market, farmers and the ideology of technology.

Thursday, 11:00 – 13:30

T2A Technical Democracy: What are its Antecedents and its Prospects? 2 (In French)

Location: H 21

Organiser: Pierre Lamard, Mathieu Tricot and Yves-Claude Lequin

Chair: Mathieu Tricot

Commentator: Pierre Lamard

History of Technocritics: A Series of Ideas and Arguments in the Francophone World, from 1900 to Nowadays (In French)

Dr. Alexandre Moatti

History of technocritics is a rich field of study. Since the beginning of the 20th century (and especially after WWI), we can find revolving technocritical ideas and arguments, against technics (as well as against science), or against technical modernity: in the 1930s, in the 1960s and 70s, but also in our contemporary period (for example some contemporary arguments against internet – like “solutionism” – can be found about technics in general, by Jacques Ellul or others in the 80s, as well as in the 30s). Studying history of technocritics since several years, I will draw a list of revolving arguments that can be found against technics from the 1920s to nowadays, in the francophone world. A particular attention will be drawn on the 1960s in France: technocritical discourse as well as technoprophetical discourses (exaltation of the technical modernity by the “visionaries of the modernity”) will be compared to contemporary discourses in the 2010s. Another element in my study of technocritics is the way technocritics and exaltation of technics (what can be called “technoprophetism”) dialog between each other, in each historical period. On all its facets, history of technocritics is a key element to analyse the current relations between science and technics on one side, society and democracy on another side. I will conclude insisting on the

necessity of an interdisciplinary work (f.e. with history of literature), as well as the necessity of a European perspective to better understand technocritics from 1900 to now.

A Human and Social Sciences Contribution to the Development of Technological Projects : 'Ethnographic Design' and 'Technical Democracy'

Dr. Mathieu Triclot

Ph.D. candidate Nicolas Simoncini

Dr. Bénédicte Rey

If scientific literature has often established the importance of cognitive and social factors in the failure of technical objects (Rogers, 1962 ; Morel, 2002 ; Lefeez, 2017), Human and Social Sciences researchers do not generally have the opportunity to intervene in their early development. This paper is based on an ongoing technological project, in which acts a Human and Social Sciences team. From the critical study of this ethnographic field based on interviews and observations, the 'ethno-design' approach theorized by the team aims to offer an original method to reopen technological 'use scripts' (Akrich, 1987), insisting on a deep knowledge of professional environments, 'recurring action patterns' (Cohen, 2009) and meanings given to activities. Inserting 'elements of technical democracy' (Lequin and Lamard, 2014), the objective is to anticipate the transformations implied by the objects in stakeholders' practices and the 'ethical decision landscape', far from a neutrality hypothesis which can characterize technical objects or a fascination for autonomous objects. This trajectory, which takes into account the complexity of interactions around devices, conducts to stress several recommendations : minimal perturbation of frames and operating chains, socialized achievement considering the multiplicity of negotiations which take place around artefacts in professional environments, attention to possible appropriations and transformations and to the use of collected data. At last, we need to discuss the role of the Human and Social Sciences research (Beaud and Weber, 2010, Ould-Ferhad, 2008) to understand his influence on the construction of such technological projects.

Another Technical Democracy is Possible:

Approach of Responsibility by Ecofeminism (In French)

Dr. Marie-Pierre Escudié

Dr. Thomas Le Guennic

With this communication, we suggest to work on the concept of responsibility within the context of technical democracy from the ecofeminist approach. More particularly, we will focus on protests around the anti-nuclear movement. The importance of the idea of responsibility in ecofeminist approach develops sensitive, emotional, subjective knowledge, practices and values. Theoretically, the bases

and the critical placements analysis of the ecofeminism allows to consider another relationship with technical democracy. This relationship should be able to refresh engineering sociotechnical processes. We will consider ecofeminism as a technical democracy thought, notably from the role of empowerment in this movement. Then, we will identify ecofeminism processes and form of governmentality: gender studies of risk, situated knowledge about technic and reclaim individual and collective responsibility. In practice, we will ask if ecofeminism is it a solution in engineering studies? To conclude, the “nouveau printemps” of ecofeminism will it provide a theoretical background in the way to define another technical democracy as possible? More generally ecofeminism is it a politic of technology? An educational path for engineers is it fruitful? Those questions will be raised on this communication in the way to create a dialogue between technical democracy backgrounds and perspectives.

T2B 13th Annual Symposium of the Social History of Military Technology 2

Location: HR 5

Organiser: Bart Hacker and Ciro Paoletti

Chair: Bart Hacker

The Mortar and the Sword: Weapons in Fantasy and Reality *Professor David Ritchie*

The last talk I gave at ICOHTEC was about changes in the display aspect of weapons and their relationship to Modernism. Chapter Two, if I can call it that, is about changes to the reality of weapons themselves and their status in our moral imagination. Weapons are designed to harm people, so an alien from space might be forgiven the assumption that we humans love or hate weapons equally. But in fact we hate I.E.D.'s and love tanks, hate gas, love suits of armor. Some have suggested that there are gender or even sexual elements to this division. Roman soldiers made crude jokes about swords and scabbards, perhaps because the Latin for scabbard is vagina. Helen Caldecott wrote of Missile Envy. There is more to the problem of weapons in fantasy and reality. When my daughters and my wife asked if I enjoyed the movie, “Wonder Woman,” I said there was something I needed to think about. I did think about that question and I now have further questions which reveal, I hope, something important about weapons: why was “Wonder Woman” set in the First World War and not, say, the American Civil War? What does one learn by comparing it to an Australian Aboriginal movie, “Ten Canoes”? Does Achilles need a heel? What took me back to my first ever historical study, an oral history of the Resistance in the Vercors? Why did two students, both veterans of Afghanistan, when designing a game that was to translate some of their experience to civilians, arm their characters with edged weapons? My thesis is that closing with the enemy is understood to be heroic because it's a dangerous thing to do, but for other reasons, too.

The Advantages of Brick Fortification, from Antiquity to the Modern Era
 Professor Jean-Nicolas Corvisier

*In the modern era, the advantages of using bricks in fortifications is mainly justified by rapidity of construction and relatively low cost. Additional reasons for using bricks applied in antiquity. Even sun-dried brick could adequately resist the battering of artillery, though that artillery was torsion-powered rather than gunpowder-based. Such Latin texts as the *Architectura* of Vitruvius explain that bricks were crafted in sizes determined by whether they were to be used in civilian or military projects. The brick reduced the risks of *emplekton* construction, which entailed the use of rubble-filled walls. Moreover, brick holds together better in the earthquakes common to the Mediterranean world. Inscriptions show how the walls were made and refitted for military purposes, but archaeologists much work to reconcile the remains of fortifications with textual descriptions. Cross-referencing these sources with the lesser-known technical texts of Greek strategists allows to assess the benefits of brick fortification. From the military point of view, brick's supposed disadvantages, mainly friability and susceptibility to water damage, mattered relatively little in practice. Military men tailored their action to the kind of fortification. They sought to optimize the use of brick, both strategically and tactically, with much emphasis on techniques for using siege machines to attack and defend fortifications.*

From Concept to Combat: The First Decade of the Medici Ducal Fleet, 1548–1558

Graduate student Andrew Tzavaras

*In the first half of the sixteenth century, much of the Italian Peninsula remained a battleground between the Habsburg and Valois. As part of his grander strategy in this war, Holy Roman Emperor Charles V worked with Pope Clement VII to reinstate the Medici over Florence in the late 1530s. Meanwhile, the Valois and their Ottoman and Barbary corsair allies continued to attack the Tuscan coast in the 1540s and 1550s. These episodes emphasized the real threat to Tuscany, specifically the Piombino channel – the key maritime route between vital Habsburg territories: Naples in the south and Genoa in the north. First, this paper will briefly explain Tuscany's geopolitical importance during the Italian Wars. Second, it will examine Duke Cosimo I de Medici's (Tuscany's) role within the Habsburg Italian naval network. Using archival documents, it will assess how Tuscan vessels were designed, built, armed, and crewed between 1548 and 1558. This investigation will follow the deployment of the Medici fleet from concept, to construction; to combat. This discussion will include the technological expertise and equipment required during the early years of the Medici *Arsenale* in Pisa, the weapons technology used by marine troops, and, of course, artillery. Thus, having described it at the technological level, this paper will place the Medici fleet within*

the context of the Spanish-Habsburg military system. Furthermore, it will seek to reveal and understand the Medici strategic outlook by the late 1550s.

T2C ICOHTEC Prize Session

Location: Amphitheatre E 01

Organisers: Yoel Bergman, Hans-Joachim Braun and Elvira Callapez

Chairs: Hans-Joachim Braun and Elvira Callapez

Friday, 20 July

09:00—10:30

FIA Technical Democracy: What are its Antecedents and its Prospects? 3 (In French)

Location: H 21

Organiser: Pierre Lamard, Mathieu Triclot and Yves-Claude Lequin

Chair: Yves-Claude Lequin

Commentator: Mathieu Triclot

Participatory Research, Part of a Deliberative Technical Democracy (In French)
Dr. Bertrand Bocquet

The scientific research domain has undergone a deep reconfiguration especially with the definition of societal challenges, which having sometimes immeasurable dimensions. These challenges ask a better understanding of raised problems, a strong interdisciplinary in the knowledge production and in the design of innovative solutions. Many research programs today experiment works included natural sciences, social sciences and humanities by taking into account the institutional, economic and citizens concerns. Nevertheless, this last dimension remains underestimated in research policy. However, the sciences-society link seems difficult to conceal for the sociotechnological developments in democracy¹. The general context of this issue must be found in the development of deliberative democracy which impact the field of sciences, technologies and innovations. The citizen sciences and participatory research are an achievement of this impact and represent an interesting domain with many different experiments². Some typologies have been drawn to classify them according to their methodologies, their research topics or their participation levels of citizens. Another approach could be a classification by the research promoter³. In other word, who ask the research question? By this way, we distinguish better the participatory research concept based on a real co-building process. This last one starts from the problem design up to the dissemination of results. Two examples are interesting to investigate: the Science shop North of France and the CNRS research group Participatory Action Research and Citizen Sciences (GDR PARCS). The Science shop North of France leads scientific works in all disciplines. Its specificity is the co-production of knowledge by involving applicants (Civil Society Organizations), academics (researchers, students) and active facilitator of the Science shop. We show that this hybrid and stable university facility allows treating questions with the respect of equity between each stakeholders and with a high-level scientific requirements. For GDR PARCS, we have an interesting experience quite different of a common operational mode of a GDR. It has worked as an “outside the walls” laboratory where the main aims are the development of methodologies of Participatory Action Research (PAR) for making these three dimensions operational in a research project

Gamma Detector in the Service of Technical Democracy: A Case Study on the Mine Waste Inventory in Piriac-sur-Mer (Loire-Atlantique, France) (In French)
Dr. Saliha Hadna

In the past three decades, expertise is highly questionable (Horlick-Jones and From Marchi, on 1995; Granjou, on 2003; Collins, on 2014) particularly in the areas of health and environment (Lascoumes, on 2002). By analyzing a controversy on mine waste inventory, we try to understand how citizens use measuring instruments, which are originally reserved for "experts". Although literature often used the concept of "instruments" to address issues relating to "collective action" and to "institutions" (Lascoumes & Galès, 2005, 2007; Bourhis, 2011; Revillard, 2013), it is proposed to address this concept of "instruments" as material devices of production of knowledge. It follows our thesis work that the use of the Detector Gamma (DG5) by association activists appeared as a relevant question. It begins with an analysis of the configuration of the actors involved in the controversy in the former uranium mine of Piriac-sur-Mer (Loire-Atlantique) where abnormal levels of radioactivity have been found by the uranium society and the CRIIRADI. We demonstrate that the pollution of a tourist area in 2014 focused citizen's attention on the question of mine waste inventory. In addition to this first alert, a delay taken by the uranium society in the inventory of the polluted zones, and a democratic deficit owed notably to the lack of dialogue instance open to the associations as recommends it the circular Borloo (2009), relating to the management of the former uranium mines. Then, on the basis of semidirective interviews, it will emerge that the DG5 fulfils an essential function in controversy by contributing to a form of technical democracy: a group of citizens has decided to measure itself the radioactivity in Piriac-sur-Mer. We think about the conditions of this "citizen's expertise" (Sintomer, 2008) and expected results by these citizens about this technical and democratic experience. Because if this group of citizens has indeed contributed to the mine waste inventory, the lack of consultation is felt by most of them as a brake in the development of what we call technical democracy.

Mobilities, Circulations and Technological Democracy. Building the Discourse of Technology in the United States: Identification of the Process and Archives in the 20th and 21th Century (In French)
Dr. Vincent Dray

This paper will review and analyze the historical archives that can teach us about US conceptual positions in respect to technology, their forms of legitimation, the perspectives of the historical actors and the institutions in which they are constructed. These processes, contested or validated, represent a field of study of the technical democracy. Indeed, these processes suggest a comprehensive epistemological framework in order to understand the full implications of technics. This conceptualization point out the emergence of a making process about various trends of technical democracy. We speculate that the long-term context of the internationalization of technology have made a transfer of European technologies and knowledge (exchanges, scientific migration and influence: in the course of the

twentieth century) adapted to the US technological crucible. The comparative studies, analysed as productions of technology, represent dynamics and proposals, which has transformed the meaning of technology. The process, identified and quantified, clarifies the transfer of proposals to the national institutions (NRC, American Academy of Engineering...), revealing a technological democracy model which has participated in a rapidly evolving of the US techno-science framework by which technics extended the US scientific system area. This trend is closely related to the development of technology as a social science, questioning the interplay between governance and spread of mutations.

FIB Turns in the Energy Supply: Past, Present and Future I

Location: H 13

Organiser: Timo Myllyntaus

Chair: Timo Myllyntaus

Hydroelectricity, Industrialization and Regional Development in São Paulo

Professor Gildo Santos

How did electrification contribute to the territorial and economic transformation of a relatively backwards area at the end of the 19th Century into the most dynamic Brazilian region in a few decades? To search for an answer, the “Electromemory Project” surveyed the sites of hydroelectric generation in the State of São Paulo, whose first power plant dates back to 1893. The initial idea was to find unknown archival material stored in more than a hundred power units scattered in an area of about 248,000 km², and counting a population of over 45 million people. Field trips to the sites took a team of experts to a representative set of power stations (a sample of more or less 50% of the total), and some regional and local substations. They were all built by private enterprises between the advent of the Republican era in Brazil just before the 1890’s and the age of governmental companies, which started around 1960 and ended with the neoliberal privatization conducted at the end of the 20th century. It is also the purpose of this text to discuss some political issues and consequences deriving from the natural as well as the forceful extraordinary extension of the useful life of those older power stations.

Energy, Desalination and Solar Ponds: Success and Oblivion of Salts and Solar Power in Atacama Desert, Chile and Beyond, 1907-1981

Dr. Nelson Arellano

Thermosolar artifacts were used in large scale since 1872 when Charles Wilson invented the first desalting apparatus in Atacama desert. After this, different places as Wendover (Utah, USA), Patmos (Greece), Barcelona (Catalonia, Spain) developed research, planning, projects, laboratories, industries, etc. for sweet water, potash,

lithium, and electricity. Some of them had success and others were interrupted and fell into the oblivion.

History of technology offers us a multidisciplinary approach to understand the artifactual discard and, later, the intermittent duration of technology. The selection process of technologies is complex because combine several factors of economy, policy, environment, knowledge, social values, cultural matrix, among others (Basalla, 1988). As David Edgerton wrote: the winning technology selected is not always the most economical (Edgerton, 1999). Therefore, the framework pushes a discussion about Past Future, Energy and Civilization, and demand for a proper research for this narratives.

An extensive search in USA, European and Chilean archives found a prolific effort in research and development in XIX and XX centuries trying to produce different solutions for replacing the hegemonic sources of energy provided by hydrocarbon. Those archives contain valuable documents. Also, some specialists were interviewed as an eyewitness. Our sources were: Engineering journals and books; archives in USA, UK, Spain, Italy, and Chile; and, Interviews in Greece, Spain, and Chile.

The analysis of this information demonstrates that those stories of thermosolar technologies remain in the field of loose memories. Histories of technology, environment, science, economy, and politics haul a very important debt with inventors, researcher, investors and enthusiast engaged with their collaborative network for a crucial area of sustainability that try to answer if technological Drive from the Past to Future.

References

BASALLA, George (1988) The evolution of technology, Cambridge University Press.

EDGERTON, D. (2011). The shock of the Old: Technology and global history since 1900. Profile Books.

The Hydroelectric Matrix in Brazil: Benefits and Drawbacks of the Interference of Public Power Ph.D. candidate Alexandre Ricardi

In Brazil, the hydroelectric matrix was preponderant practically since the beginnings of the 20th century, almost at the same time the coal was abandoned because the cost of imports was very high. Thus, the first big hydroelectric plant built in Brazil, in São Paulo State, was the Parnaíba plant in 1901, reaching 16,000 kW in 1911. After that, was built Fontes plant in Rio de Janeiro, in 1908 with 24,000 kW; Itapararanga plant, in 1914, with 30,000 kW, reaching 56,000 kW in 1925 and Cubatão plant, built in 1926, reaching 76,000 kW in 1928. All these plants were built by Brazilian Traction Light and Power through their subsidiaries. It meant that the foreign capital took the initiative to develop this sector, but kept the monopoly about it for almost 80 years. The Brazilian legislation emerged in 1905

in the form of a Waters Code, but it was not approved due the influence of the foreigners among the political class, remaining in the Congress until 1934. The nationalist government of Getulio Vargas tried to approve this Code and create a state-owned company to develop the electric sector, Eletrobrás, with little success.

In all this time, the Brazilian electric matrix was always the hydroelectric, in what would today be considered a clean way to generate energy. However, the country never manufactured turbines, dynamos, motors keeping a subordinate position in the International Division of Labor in electric sector. After a long interregnum, managed to produce wires and poles. However, in contemporaneity, a well consolidated electric sector has become very important in several countries, as a source of cheap energy to industrial development, jobs, business opportunities and wealth. Thus, we intend to present how and why in Brazil this combination of business and technology in the electric sector did not produce such great fruits.

FIC The History of Repair Cultures and the Temporalities of Technology

Location: H 14

Organiser: Stefan Krebs

Chair: Hans-Joachim Braun

Tero-Cultures: The Temporalities of Maintenance

Professor Gabriele Schabacher

*The globalised and digitised world often seems primarily occupied with processes of innovation and production. This overall focus on the “new” is prominent in cultural discourses of the present. But another focus of attention can also be identified in our technological culture, one that is exclusively concerned with the used, the old and the broken. A comprehensive series of practices keeps large-scale technical systems, buildings, organisations and other objects functioning despite breakdowns and disturbances as well as erosion and decay. Unless these practices of repair, maintenance and upkeep occur in response to catastrophic situations, however, they tend to remain “invisible” in everyday life, since they are usually organised as or embedded within routine procedures. The paper will focus on these routine processes of maintenance in socio-technological contexts and analyse them as a “cultural technique” of existence in a broader sense, including phenomena such as gardening as well as optimised feedback loops of lifecycle management (*terotechnology*). Focusing on the specific temporalities inherent in these practices, the paper will show how the cyclical and repetitive order of care is highly relevant to general patterns of cultural reproduction.*

Cultures of Self-Repair: Community, Identity and Appropriation of Technology

Dr. Stefan Krebs

Recent self-repair cultures, as practised in local repair initiatives (e.g. repair cafés and fix-it clinics) and fostered by online resources like I-fix-it.com, are often described – both by those involved and by social scientists – as sustainable practices that can help ease the huge environmental footprint of contemporary consumer societies. But self-repair is not only a sustainable practice that keeps a technology running and thereby extends its lifespan; it is often an end in itself. Apart from fixing technical problems, self-repairing also creates communities of practice; it helps to shape and maintain individual and collective identities and can provide “self-repairers” with assurance as they master new technologies. So the practice of self-repair is highly relevant for many reasons in addition to environmental considerations. Various examples from the history of technology show that past (self-)repair cultures, for example the self-repair movements of the interwar years and the 1960s and 1970s, seem to have had much in common with current self-repair cultures. The paper will use the example of automobile maintenance and repair to take a closer look at these older repair movements and investigate differences and similarities between past and present self-repair cultures. I will argue that considering self-repair as a social practice enables historians of technology to study broader relations between technology and society, such as hidden socio-technical hierarchies.

Temporal Strata of Technologies: From Repair and Obsolescence to Questions of Technology’s “Afterlife”

Professor Heike Weber

*This presentation tackles the issue of technology’s durability and lifespan beyond questions of repair and obsolescence. For 20th-century consumer technologies it raises a number of questions: What happens to a technology after it has been used once? How important were second-hand markets for mass consumption? Used cars and mobile phones, for instance, were often exported to places far removed from their first use to find a second or third life elsewhere. How do technologies ultimately disappear and what kind of “afterlife” might they have? Indeed, the 20th century seems to be the first era where issues such as “aftercare” and the dismantling or disposal of technologies have become a technical (and environmental) challenge in their own right. While historians of technology have much to say on the social, economic, political and spatial dimensions of technologies, and even on the way in which they transform temporal concepts, they rarely reflect on the temporal dimension of technologies. “Temporal strata” (*Zeitschichten*) is a term coined by the historian Reinhart Koselleck. I will draw on this term to conceptualise the different ways in which technologies materialise or influence society’s timelines and concepts of time. By the late 20th century, the temporal strata of technologies included challenges raised by both very short and very long technical lifetimes – from computer chips that become obsolete in less than two years to radioactive waste that remains a burden for thousands of generations to come.*

FID Technological Innovations in Architecture

Location: H II

Organiser: PC

Chair: Hermione Giffard

Aesthetics and Acoustics: A History of the Concert Hall as an Epistemic Object

Dr. Darryl Cressman

The purpose-built concert hall, as we know it today, emerged out of the confluence of the public concert and the aesthetic philosophy of musical romanticism. By the late nineteenth-century, the “shoebox” style concert hall was an important object through which aesthetic knowledge about what music means (it is a serious art form) and how it is to be listened to (in attentive silence) was communicated.

In 1900, the concert hall became an object of scientific research and experimentation when Wallace Sabine developed the first mathematical theory that could accurately predict how a building would sound. Historians of technology use this event to mark the beginning of a modern era of acoustics and concert hall design. A consequence of this historical narrative is that the aesthetic and cultural history of the concert hall that preceded Sabine has become distinct from the scientific history of concert hall acoustics.

*Using the case of Berlin’s *Philharmonie* (1963) and other “vineyard” or “wrap-around” style concert halls, I will argue that innovations in acoustic science are inseparable from the aesthetic expectations that are pre-supposed in the idea of the concert hall. Drawing from the scientific literature on architectural acoustics, I argue that “vineyard” concert halls can be considered experimental objects that allowed acousticians and physicists to develop and refine theories of reflection and reverberation. These theories, in turn, allowed for architectural designs that materialized scientific knowledge about acoustics while also making explicit aesthetic ideas and norms that had governed classical music culture since the early nineteenth century.*

In terms of conference themes, this research falls under the sub-theme of ‘the significance of technological heritage and material culture for the future.’

Carrier Weathermaster System Air-conditioning in Postwar Modern Architecture in Finland in the 1950s
 Ph.D. candidate Seija Linnanmäki

20th Century modern architecture developed after the First World War to meet the needs of social, political, economic, cultural, aesthetic, hygienic and technical demands of Western welfare, as first stated by Le Corbusier in 1923 *Vers une Architecture*.

Social housing, welfare and standardisation were ideologically closely related to modern architecture. Building construction technology developed new materials glass, steel and concrete. The new environment of the *machine aesthetic* was equipped with new innovations, modern mechanical and electrical services, which enhanced the role of technology in buildings, as discussed by Reyner Banham in *The Architecture of the Well-tempered Environment* (1969).

Therefore, modern architecture is applicable to be studied by the method of Social Construction of Technology (SCOT) taking into account those various aspects in accordance to the *principle of symmetry* (as presented e.g. by Timo Myllyntaus in 2010, *ICON 16*).

Indoor air quality was controlled by new ways of air-conditioning. First large deployment of Carrier Conduit Weathermaster System in Europe was installed in Industrial Centre, Helsinki. Remarkable commerce was negotiated in Syracuse, New York in 1950 by Finnish HVAC-engineer Torsten Kranck. Licensing agreement in 1953 between State Metal Works and Aircraft Factory and Carrier Corporation started the Finnish comfort air-conditioning industry.

I am comparing the processes of design and building work, and the architectural image of two main offices, built in Helsinki, Finland 1949-1953 by architects Aarne Ervi and Viljo Rewell. Most *relevant social groups* in my study are architects and HVAC engineers (new profession), authorities, bankers, state-owned company Imatran Voima Oy and Industrial Centre, manufacturers, workshops and builders. Elizabeth Shove has shown the social effects of air-conditioning in *Comfort, Cleanliness + Convenience. The Social Organization of Normality*. 2003.

After the Second World War new technologies, air-conditioning and modern architecture had significant symbolic role in Post-War reconstruction and the recovery of national identity.

Sources

Schultz Eric B. 2012, *Carrier Weathermakers to the World. The Story of a Company. The Standard of an Industry*, United Technologies, USA.

From the Place of "Production Machines" to the Place of "Dream Machines": the Factory Space as a Praise for Emptiness
Professor Raffaella Maddaluno

The industrial architectural space raises interest and arouses people's curiosity for its atypical connotation. This interest is partially due to the encouraging constructive rigor that an industrial building must respect in order to perform the functions that the machinery has imposed over the course of time.

At the time that machines leave their own space, due to obsolescence or degradation of the building, this space begins its relationship with the "void".

The action of the re-appropriation of spaces follows the general law that: if a "full" with its dismantling has created a vacuum, soon another "full" will take on forms and characteristics. When Carlos Martín Arís deals with the concept of emptiness referring to the work of the sculptor Oteiza, he defines the process as a spatial unemployment, a subtraction for the creation of an active void, a new source to create energy and chances. "The sculptural mass corrodes and reduces, and while it tends to atrophy, the void takes possession of the activity. The outer space penetrates the limits of the sculpture and blends into that. The ultimate goal is the conquest of an evacuated, available space, where the traces of the laborious process of subtraction and elimination remain impressed." Carlos MARTÍ ARÍS, C., Silenzi Eloquenti, Borges, Mies van der Rohe, Ozu, Rothko, Oteiza, A cura di Simona Pierini, Milano, Christian Marinotti Edizioni, Pag. 105.

How does a productive "vacuum" fill up? Which new entity will replace the heavy material presence of the machines? What kind of activity are related to this form of "sublimation of matter"? In the various interventions of redevelopment of industrial spaces, this task is often entrusted to art and its various forms of expression. The concept of production "normality" is replaced by the artistic "exceptionality". This paper aims to analyze some significant examples of the replacement of Italian and Portuguese "voids", trying to analyze how space has maintained or denied the relationship with machines.

Green at Heart: From Old Smokestack Industry to Platforms of Sustainable Urban Future
Dr. Markku Norvasuo

Urban developers have long known the attractiveness of old industrial milieus. Such environments have resulted from deindustrialization and economic change. Residential quarters are frequently created around remnants of smokestack industry, Rough environments offer a "historical touch", and old buildings provide valued loft apartment types. This phenomenon has been studied from many aspects like economy, geography, urbanization, gentrification, branding and brownfield development.

In my paper, I will discuss yet another aspect: the way industrial history is used to promote assumed future technology. Energy was once a prerequisite for industry; now

these places are presented as “ecosystems” of renewable energy. My primary questions are: 1) Why do milieus that used to stand for adverse things like chemical hazards, air pollution and even urban misery, now symbolize clean and harmonious future? 2) In which ways do these projects refer to local industrial past? The paper describes this phenomenon from the perspectives of urban history and the relation between industrial technology and urban structure.

The analysis consists of two particular cases of recent urban development in Finland. They are the Kangas area in Jyväskylä and the Hiedanranta area in Tampere. In their emerging forms, the projects seem to simulate the character of past industrial communities. Both areas are constructed around a former pulp industry complex and both cities have a noteworthy industrial past. The research material includes available historical accounts, planning documents, diverse advertising and promotion material, and interviews of project planners.

FIE 13th Annual Symposium of the Social History of Military Technology 3

Location: HR 5

Organiser: Bart Hacker and Ciro Paoletti

Chair: Ciro Paoletti

Kriegsspiel goes forth: Notes on the Early History of Professional Wargaming in the British Army

Professor Jorit Wintjes

For almost half a century after the introduction of the Prussian Kriegsspiel to the Prussian Army in 1824, professional wargaming remained unique to the Prussian Army. After the great and unexpected success in the Franco-Prussian War of 1870/71, however, wargames were rapidly introduced to all major European armies. While the Prussian Kriegsspiel itself has seen some attention in recent years, the introduction of professional wargaming to European armies in the decade after the Prussian victory of 1871 is so far totally unexplored. The paper focuses on the British Army, which was among the first armies to take up professional wargaming after 1871. It takes a closer look at how the British military establishment first gained knowledge of the Kriegsspiel through two key presentations in 1872 by the Prussian military attaché in London and by Prince Arthur, how the British Army then initially adopted a translation of a Prussian set of Kriegsspiel rules and acquired at least some wargaming material from Prussia, and finally which scenarios were played during the 1870s and how they related to the strategic thinking at the time. Much of the relevant source material on the wargames themselves – rulesets, wargame scenarios and wargame reports – was published at the time, often in contemporary newspapers, while for information on those involved in running wargames in the British Army archival material has been used.

The First Ottoman Pre-dreadnought: The Abd-al-Kadar
 Professor Esat Arslan

The Abd-Al Kader (Abdul Kadir) to be presented in this paper was planned as being the first pre-dreadnought battleship laid down in 1892 at the Istanbul Ottoman Dockyard for the Ottoman Navy, the first vessel of this type to be ordered by the Ottoman State during the reign of Sultan Abdulhamid II. In the beginning of his reign, it was predetermined a little expansion in the Ottoman Navy, subsequently its construction work was started in 1892 in the context of this conceptual framework. Soon after, building work during the skeleton construction phase was slowed down, due to the sultan's suspicions and fear of a Navy-based coup against him. Abdulhamid II's suspicion of the reformist admirals, who supported his Premier Midhat Pasha, made things even worse, and consequently almost the entire Ottoman fleet was kept locked inside the Golden Horn for more than 3 decades, during which the ships decayed. The only progress in the early 1900s was the covering the skeleton with armor, a couple of years later its construction got postponed to next years, at last terminated. But the work was planned to continue in 1904, but the skeleton's blocks had to be shifted to prevent hunching and sagging. As a result, it was thought that shipbuilding would no longer be possible. In 1914, he was smashed on the sledge and taken off.

FtF Humans Encountering Medical and Psychological Technology

Location: H 26

Organiser: PC

Chair: Donna Drucker

Technology in Health Care Facilities and Environment of the Patient

Dr. Agata Gawlak

Researcher Magda Matuszewska

Ph.D. candidate Paulina Szuba

Architecture of hospitals, thus facilities of complex functions, is predetermined with the development of advanced technologies, which in fact make up an important and integral part of these facilities. We may come up with a statement that technology, today in particular, creates the architectural space of hospitals. Referring to the Vitruvian Triad, which defines the three criteria for an architectural piece: Venustas (beautiful), Utilitas (functional), and Firmitas (structurally sound), in case of hospitals, technology seems to supplement the three criteria or may even prevail over them today. That's why hospitals are often called "treatment facilities".

Changes in the methods and technologies of treatment entail changes in the treatment processes, and in effect changes in the building form and its interior space, or in other words - changes in the entire set of features of hospital environment.

Continuous development and changes in technologies render newer and newer spatial solutions for hospital buildings. On the one hand, such solutions affect the hospital functional zones, but on the other hand, also the circulation and communication between them.

What's important, hospital environment, architectural space, in accordance with the research, exerts impact on the treatment processes, patient's recovery, organisation of work in a hospital and the quality of medical services. Spatial relations in the context of technology are reflected in the hospital environment perceived and sensed by the patients. The quality of space in a hospital, in view of advanced technologies and available treatment methods, is most often measured with the users' satisfaction surveys.

We have reviewed the field specific literature focused on technologies in hospitals in the context of the quality of hospital space dating back to the 19th century and we have referred to the present state of research and know-how on modern technological solutions.

This presentation is to present the history of solutions applied in hospitals and to assess the impact of technology on the changes in spatial and formal aspects of architecture of health care facilities, which create the patients' treatment environment.

Technology and Expression of Love: Impact and Consequence of Technology on Love and Subsequent Human Emotions

Dr. Rituparna Das

Love, being one of the primordial human sentiments, got manifested through different forms of expression. The amorous love song of the anonymous lover of the ancient past who etched it on some stone tablet using some rudimentary technology; or the magnificent sculpture, that had been created with the technological wonder of architecture, dedicated to one's dead lover; or the love letter sent through the first telegram message; or the affectionate emoticons sent through some instant messenger - all are but manifestation of love, which came to light with the help of technology.

My paper would argue that the expression of love always thrived with the aid of technologies. Such expression is encoded through technology in a way that it obtains a paralinguistic dimension. For example, a century ago the communication of long-distance romance would have been merely through posts. A medium, by virtue of its own, would associate itself with myriads sentiments like anticipation, patience, longing and misgivings. Today, the same communication would take place through

instant messaging or video callings. These technologically advanced processes come with an essence of familiarity that almost eradicates the sense of distance. The virtual presence of the lover is so strong that the pang of separation is barely evident. It would equally impact the way the lovers would perceive each other-their presence as well as absence. Technology has a strong bearing on as to how love is perceived and conceptualised in that respective era. After all, Romeo and Juliet would not have died had they had a smartphone with 4G connection in hand, would they?

My paper would analyse the interrelation between technology and the expression of love-both in fictional and nonfictional mediums (since the last century till the present day). By doing so, it would be highlighting the bearing of technology on love and the consequence of its impact on comprehending human relation in today's context and that of incoming future.

The history of plasma in the context of sciences

Ph.D. candidate Anna Manukyan

Educational institutions - 1980-1993 secondary school No 3 named after N.K. Krupskaya, Secondary School No. 14, Razdan, Armenian SSR; 1993-1994 - Lyceum named after D.A. Furmanova, Kineshma, Ivanovo region. In 1994, she entered the Ivanovo State Chemical and Technological Academy (since 1998, Ivanovo State University of Chemical Technology) for the specialty "Technology of Electrochemical Productions". During her studies at the university she was actively engaged in scientific work, defending with honor the final qualifying work on the topic "Investigation of the influence of fluoride additives on the process of electrodeposition of bronze from oxalate electrolyte". In 1999, she entered the postgraduate course at Ivanovo State University of Chemical Technology and under the direction of Doctor of Technical Sciences, Professor Yu.Ya. Lukomsky was engaged in research in the field of electrochemical deposition of metals on aluminum and its alloys. In 2000, she defended with honors qualification work in management. In 2002, she defended her thesis of Candidate of Technical Sciences on the subject "Electrodeposition of tin and its alloys on aluminum from an oxalate-fluoride electrolyte".

In 2003 - elected to the post of executive secretary, and then head of the editorial board of the journal "Izvestiya Vysshikh Uchebnykh Zavedenii. Seriya "Khimiya i Khimicheskaya Tehnologiya" (Russian Journal of Chemistry and Chemical Technology)

At present, the field of scientific interests is the history of plasma and its applications in the synthesis of nanosized particles in plasma-solution systems, as well as the purification of aqueous solutions from organic and inorganic contaminants.

FIG From Insights to Technology to Technological Futurism

Location: E IIB

Organiser: PC

Chair: Jukka Kortti

The Historical Significance of Korolyov Space Museum Collection, Zhytomir, Ukraine

Researcher Olena Zosimovych

The museum objects of the space technology in the exhibitions of Sergey Korolyov Space Museum (Zhytomyr, Ukraine) is described in the article. The author is the researcher at this Museum. She is also lecturing the course of Historical Sources Studies at Zhytomir I. Franko State University. During the studying the problem she analyzed the national and international scientific literature, publications (André Desvallées, Farrel Keith, Yaroslav Kalakura, Yuri Hramov, Irina Dyachuk) and data from Internet.

The purpose of the paper is to appreciate space technology artifacts from Sergey Korolyov Space Museum as valuable historical sources containing different types of information. The author describes the main classification schemes of historical sources and proposes her own ones for museum objects of space technology; defines the main stages of their history; determines their particular qualities among the variety of other artifacts. For setting the reliability and historical significance of space technology artifacts she uses such terms as authenticity, probability, completeness, novelty and representativeness. A major of exhibits of space technology in Korolyov Space Museum belongs to primary sources. They contain various levels of historical information, besides technological one. In combination with the secondary and tertiary sources they reflect economic, social, scientific, political aspects of the society's life. The statement that museum objects of space technology can serve as the basis for obtaining scientific factual historical knowledge is affirmed in the conclusion of the article.

Future Mobilities and the Role of Historians

Professor Simone Fari

Researcher Massimo Moraglio

The main objective of the paper is the critical interpretation of the history of the future mobilities.

On one hand, In the last forty years, historians, geographers, sociologists have been actively investigating transport, mobility and flows, addressing often in a self-reflexive way the growth (and the inner contradictions) of the transport regimes and

discourses. In the meanwhile, in the world of social science, the concept of 'transport' has been deeply investigated, defined and criticized as insufficient to understand the movement of people, things and ideas. The rise of the term 'mobility' has redefined the horizons. Mobility is not only a way of researching how people and goods move around, but it is a way of thinking about human societies.

On the other hand, the debate about future mobilities has increased for three reasons. Firstly, some individual entrepreneurs and some corporations belonging to "New economy" have invested massively in the mobility industry. For example, Elon Musk incorporated Hyperloop, for the construction and implementation of a super-fast pneumatic railways, and Tesla Motors, for the production of electric and driver-less electric cars. Secondly, national and local governments are planning new mobility policies under the pressure of air pollution. For example, many western cities are developing bike-sharing a car-sharing services, perfectly integrated with public transportation infrastructure. Thirdly, many consumers are orienting to low-cost and no contaminating transport services. For example, using sharing services like Uber or BlaBlaCar allows the reduction of individual expenses but reduces also the contamination potential. Probably the combination of these transport modalities will characterize the future mobilities. Nevertheless, mainstream literature avoid the issue. Probably, only historians, with their long-run methodology, could realize a holistic study of the future of mobilities.

FiH How to Write Global History of Technology? Interactive Discussion Session

Location: Amphitheatre E 01

Organiser: Jonas van der Straeten

Chair: Jonas van der Straeten

Technology, Tradition and Deconstructing Arab Modernity

Ph.D. candidate Shorouk El Hariry

This paper reviews the current state of research on the history of technology in the Arab world by highlighting prominent examples from Arab and Western scholarship authored in the last twenty years which made use of technology and material artefacts as part of their analyses across four areas: materiality and gender, urbanization, large infrastructures, and Arab Gulf pre-oil history. The aim of this contribution is to make a case for the potential of the galvanization of the cultural study of the history of technology in the region; by exploring the low-tech, the local, the indigenous, and by delving into the Arab world's material culture as a starting point for writing a history from below, we can attempt to unravel unique, untapped narratives that promise vast avenues for future historical scrutiny. The author also touches upon theoretical issues such as the necessity of taking human activity – as well as the technology itself – into consideration in our historical accounts, with the goal of opening up spaces for the examination of users as active co-producers, identity

formation and negotiations in socio-cultural relations, and understanding the meaning technology carries, thus enabling us to see the Arab world as a creative, technological environment in itself.

From Fragmentation to Comprehensiveness: Towards a Profound and Well-balanced African History of Technology

Ph.D. candidate David Drengk

One of the major questions related to technology in Africa's past is to what extent the different fields of History of Technology (HoT) and African History (AH) have already merged. Therefore, this paper displays the different ways in which mostly Africanist scholars have touched upon topics related to the history of technology in African contexts. It locates technology in African history and contrasts it to the missing literature on technology in Africa in the HoT. With that, it pleads for the "materialization" of an interdisciplinary field of African History of Technology (AHoT), which makes use of existing bodies of literature and which comes up with new and fresh ideas for the history of technology in Africa involving for instance a methodological pluralism. AHoT enables historians of technology to get access to the interconnectedness of technological advancements within, and on, local African societies. Moreover, it displays how Africa Historians of Technology, especially African scholars, can find an entry into the field of general history of technology, a discipline in which not only African regions and societies but people from the Global South in general have too often not been represented yet, especially not as active agents. With that, this paper follows the argument of Zimbabwean historian of technology Clapperton Mavhunga who states that "Africa must be repositioned in technology other than its pitiable victim."

History of Technology on Modern China: The State of the Art

Ph.D. candidate Wei Wu

This talk reviews the state of the field on the History of Technology in China and proposes new directions historians of technology will be interested in tackling with. Traditional historiography of technology tends to focus on invention and innovation, modern and industrialized high-tech, adopting a uni-linear, deterministic, progressive and Eurocentric perspective. These problems prevail in technological history in China even today. In addition, specialists in the history of technology in China are mostly trained scientists or engineers, favoring technical interpretations rather than social, economic, cultural dimensions crossing disciplinary boundaries. The field of history of technology in the West has undergone revolutionary changes, with attention on the use and maintenance of technology, old and non-industrialized low-tech, and the role of actors, activities and agencies—the "insignificant" groups neglected by classical paradigms. The fruitful attempts made by some pioneers in Chinese History of

Technology have testified the necessity in writing unconventional history of technology on China. The talk summarizes the achievements of this new development and proposes the promising aspiration the project titled “A Global History of Technology, 1850–2000” aims to initiate. It will arouse the awareness of the importance of social and cultural history of technology in Chinese academia and further fill the gap in the pre-existing literature.

State of the Art: A Global History of Technology about India

Ph.D. candidate Aloy Buragohain

The trio of Edgerton, Nye and Hård must be read in the context of one another to build a case for a global history of material culture built on methodological plurality. In the Indian locale, this narrative is faced with the problem of defining locality as enunciated by Appadurai and the problem of colonial modalities associated with historiographical sources as identified by Cohn. The task of the critical historian of technology, then, is to go beyond the grand narratives of energy and mobility (and their presumed facilitation of “macro-survival” of the economy) to studying the minute processes of micro-survival, considering the infinitesimally small modifications and tinkering that characterizes the appropriation (and change) of technological artefacts. Existing literature lays undue emphasis on unilateral technology-transfer and “great divergence” hypotheses, related mostly to high-technology. Even in the case of low-technology and crafts, the narrative oscillates between the extremes: annihilation of tradition by colonial modernity and upgradation of the traditional by encountering the modern. Consequently, innovation, novelty and change have been favoured by historians over maintenance, stability and inertia. This paper underlines the scope for historical research on the underexplored areas of craftwork, frugal innovation under resource constraint, and persistent usage of indigenous technology (such as prosthetics). What is necessary is simultaneous critiquing of assumptions about “who” control the resources and the discourse.

Inventive Traditions and Dreams of Modernity: Current Trends in the History of Technology of Latin America

Ph.D. candidate Alejandra Osorio

In this presentation I will expose the results of an in-depth literature review of Latin America history of technology, to identify the current trends and approaches as their contributions and limitation. Following schemes as the economic theory of dependence or a deficiency theory, most studies on technology have focused on innovation and transfer, especially about the questions of industrialization, development and “modernization” of Latin American countries. Linked with this vision, several studies in the region focused on studying the rise of specialists associated with technology, such as engineers, and their relationship with nationalistic processes and projects. However, in recent years the literature about technology have integrated new methodologies and disciplines to investigate the cultural and social sphere. Two new trends stand out in the region. Firstly, the influence of STS has flourished in studies who stressed the agency of users and consumers and the appropriation of

technology. The second trend is related to the research of large infrastructure projects, as transport technologies, energy, and housing; where the development of technology links with public projects and the Government's capacity to execute them. Nevertheless, current literature in Latin America presents some important vacuums, as most of these studies analyse urban contexts and the development of cities but rural contexts and the coexistence of old technologies have been scarcely studied.

Saturday, 21 July

09:00—10:30

SIA Sustainable Buildings and Innovations I (in French)

Location: H 21

Organisers: Richard Cantin and Pierre Michel

Chair: Pierre Michel

Mosaic Tiles: The Technique

Graduate student Indio Vignes

The story of the mosaic-tile begins with the advent of industrialisation and the technical properties offered by cement. Cement became, between the late eighteenth and early nineteenth century, a major element in construction techniques.

At the time, the two great industrial powers, the United Kingdom and France, fought over who was the true founder of the mosaic-tile technique.

In 1755, the builder John Smeaton built the Eddystone lighthouse in England and began researching the use of lime and clay, both materials with hydraulic properties. James Parker, in 1796, filed the patent for cement (mixture of lime, clay and coal) which allowed him to open a cement factory. It remained open until 1810, when the patent expired.

In France, Louis Vicat published his scientific theory of hydraulicity (1818), mixing lime and clay in order to obtain a hydraulic cement: his research would prove to be of great importance for the development of this technique. Surprised by the ability to produce cement from basic natural materials, Louis Vicat created an inventory more than 300 quarries in France where limestone could be used to produce hydraulic lime.

In 1855 the developments in this area caught the attention of Mr. Delesse during the World Fair, where nearly 92 exhibitors made use of this new material.

In 1868-1869 in the region of Viviers, the Lafarge company began to produce cement from the "grappier", a waste product produced from the processes of extinction and sifting of hydraulic lime. This process led to the appearance of the mosaic-tile (Esquieu - 2013).

Several mosaic-tile techniques were used and patented at this time, which is why its exact origins remain unknown. Esquieu (2013) identifies the role of Auguste Lachave, an ironmonger who produced various metal tools used in the production of tiles. Étienne Larmande, an entrepreneur from Viviers, filed a patent for the manufacture

of tile in August 1853 but it was Lachave who helped spread the technique throughout France and abroad.

Only a few tools are needed to create these tiles: a flat (or textured) steel plate enclosed in metal walls, a "drawing mold" which fits inside the plate and a buffer (cover). The press is used to assemble the layers of the tile and to dry the colored layer. The tile is then dipped into a bucket of water so that the cement can react and harden. Hence the name "hydraulic-tile".

Thanks to its low cost, the introduction of the mosaic tile meant that even ordinary houses could be brightly coloured. The process was classified as 'industrial' owing to the use of tools and raw material that come from industrialization.

The Carpenter's Trade, between Tradition and Modernity: Alternating Training in Maisons Familiales Rurales

Mrs. Marie Pachtem, Mr. Denis Amblard, Dr. Richard Cantin

This research work questions the issue of the transmission of professional gestures of apprentice carpenters. Based on a survey and defining the notions of professional gestures, technical gestures and know-how, this work addresses the difficult question of the tensions between tradition and modernity in the carpenter's trade.

A discrepancy is noticed between the actions learned in training centers for apprentices, often from heritage (for example scribing tradition in French timber framing) and the professional realities experienced in companies, based on industrial techniques (digital machines) and innovative materials. From this observation, four issues for the carpenter trade and for the wood industry are identified: economic, heritage, social and ecological issues. In view of these issues, it is necessary to question the relevance of the transmission of gestures that once completed initial training may never be reproduced in a professional situation.

A survey based on questionnaires refined with interviews on trainers and professionals allows to make an inventory of professional skills: lost, little used and still professional practices. The question of heritage as well as the one of "genre and style" are then asked: should a gesture be fixed, to deposit these things to a museum in order to become heritage? Should not it be reproduced even if the craftsman transforms it?

This work is based on the network of Maison Familiale Rurale (MFR) in the Auvergne Rhône-Alpes region, actors of alternate training since the beginning of the 20th century, three of whom are specialized on timber frame's training. The survey of the professional world concerns the economic factors and the needs of the specific sector of timber frame's restoration, but not only because "the absence of previous knowledge of trade's memory makes difficult the analysis of a professional act in terms of genre and style".

In this work, it is then necessary to define if the questions of rehabilitation of old framework and heritage related to the wood sector should not be more taken into

account in carpenter's training. The alternating training as well as the privileged link possible in the Maison Familiale Rurale, between the training school, the apprentice and his family and the professional environment make it possible to imagine innovative forms of transmissions and practices. Thus, an offer for professionalizing additional training to overcome the theory-praxis dichotomy on the themes of built heritage (the frame) and intangible heritage (professional gestures) could be appropriate for the Maison Familiale Rurale forming carpenters.

Double Windows: An Old Technical Answer for Today's Energy Issues
 Ph.D. candidate Mike Coillot, Mr. Mohamed El Mankibi and Dr. Richard Cantin

For several years, existing buildings retrofitting strategies are affected by new energy and environmental constraints. With the view of a large energy rehabilitation of the building stock, windows replacement is systematically planned during these operations.

Windows form one of most complex system in a building. Different functions are engaged: lightning, air renewal, view to the exterior. From all times but especially from the 18th century, windows, mainly hand-crafted in wood since the 19th century, are an integral part of facades.

During the 20th century, issues due to thermal leaks, infiltrations and overheating have highlighted its advantages and weaknesses.

Despite existing architectural protection regulation windows replacement is a serious threat for some façade with an architectural and cultural heritage interest. When dealing with refurbishment, another technical solution can be considered. This is about double windows which entail the addition of a second window to the existing one, restored if needed.

A double window is an old constructive system but first scientific papers showing test protocol, procedures and experimental results only date back to the 1960s and 1970s in northern countries like Scandinavia and Canada. During following decades, several different double windows have been studied and developed.

Having thermos-aeraulic and also acoustic benefits empirically known for several centuries, double windows are still complex constructive systems hard to model. In this paper, technical evolution of double windows until the end of the 20th century are recounted according to scientific papers and some visual historic samples. The stakes of the preservation of the architectural and cultural heritage but also of associated hand-crafted skills are developed. Finally, the last innovations related to double windows, thought to meet actual energy issues, are described and discussed.

SiB Turns in the Energy Supply: Past, Present and Future 2

Location: H 13

Organiser: Timo Myllyntaus

Chair: Gildo Santos

***Crude Oil Technology Development and Globalization –
Romania a Pawn on the Chessboard of Big World Powers
Ms. Elena - Angelica Dinu***

Even though crude oil has been known and used since Stone Age, its industrial scale use and development of upstream & downstream technologies started on middle of the 19th Century. History of first steps in petroleum industry is vast and passionate. Many documents attest that Edwin L. Drake's drill equipment, on 1859, in Pennsylvania, is first modern upstream technology, and Mehedințeanu brothers' refinery, on 1857, in Romania, is first modern downstream technology.

This article proposes an analysis of connection between petroleum technology development in Romania and globalization, and the role of Romanian petroleum industry on the chessboard of big powers.

The research brings arguments on Romanian petroleum industry evolution, which can be split in four periods: beginning (1857–1895); (black) gold age (1895–1947); communist era (1947–1989); contemporaneous period, after 1989.

First period is time of premieres: first refinery, first city illuminated with kerosene, first officially petroleum production recorded and, suddenly, world discover Romania.

Publication, on 1895 of mines law, has boosted the entry of foreign capital in this industry. In few years, all biggest world powers invest in Romania: SUA, UK, Germany, France, and there are many signs regarding high-level of Romanian oil technology.

In communist era, if exposure and knowledge exchange with west countries was reduced, this important industrial branch was developed internally and with some Asia and Africa countries. Today, the world oil powers (SUA, UK, Austria, France, ...) returned and continue to develop facilities; also, Russia and Kazakhstan invest and has interest in Romanian petroleum industry.

Based on international and national publications, at that time and later, the paper highlights the importance of resources, sharing of knowledge and, certainly, money in this industry, but also the battle among power poles in global hierarchy. New data are brought showing that Romanian petroleum industry development continues in the 21st Century on high-standards, both at operational (upstream-downstream) and educational level.

Sociotechnical Imaginaries of Oil in Finland in the 1950s

Ph.D. candidate Tanja Riekkinen

I'm writing a dissertation on sociotechnical imaginaries (STI) related to oil in Finland from the 1950s to the first oil crisis in 1973.

In my presentation I analyse sociotechnical imaginaries related to oil in the 1950s. My study is set within the emerging field of petrocultures research, which aims at looking at the political, cultural and social aspects of oil. As such, it contributes to discussion about post-fossil futures. The focus is on postwar years because this is when oil culture made its breakthrough in Finland.

The research questions are: what kind of sociotechnical imaginaries did the national and global oil companies, politicians, unions, media and the associations for nature conservation present about oil in Finland in the 1950s? Why did they present imaginaries like they did? The study also considers how the phenomenon was connected to its historical context.

The sources of the research include annual reports of major oil and petrol companies, committee reports, statements of the Finnish Association for Nature Preservation, newspapers, periodicals, advertisements and newsbreaks.

Methodologically and theoretically, I draw inspiration from the energy humanities and science and technology studies (STS) and wish to contemplate the role of sociotechnical imaginaries behind a growing dependence on fossil fuels.

Technologies of the Future: Based on Modern Methods of Quantum Chemistry
Professor Eldar Movsumzade, Ph.D. candidate Galina Kolchina, Prof. Olga Poletaeva, Ms. Anastasya Bakhtina

In this works, we study the history of the precomputer period of quantum chemistry, beginning with the discovery of quantum mechanical resonance by Werner Heisenberg, and the history of the computer period of quantum chemistry, linking the experimentally obtained data and the calculated characteristics of compounds, reactions, systems (obtained with the help of quantum chemical programs). Quantum chemistry, despite its almost 90-year existence, is experiencing a period of scientific formation of its concepts, a mass exodus of calculated results to the level of good experimental data and a gradual penetration into the solution of fundamental and applied problems. The use of the possibilities of quantum-mechanical computational methods makes it possible to obtain information about such characteristics of molecular systems that are difficult to access for experimental investigation (structures of transition states and intermediates on the surface of the potential energy of the molecule in the

ground and excited state, structure of various kinds of associates, molecular complexes and clusters with strong and weak intermolecular bonds).

The real power of quantum computing stems from the exponentiality of the states of the set of quantum bits: for example, a separate qubit can be in superposition 0 and 1, while a register from n qubits can be in a superposition of 2^n values. Superstates are entangled, similar to the state leading to the EPR-paradox. The development of new programming techniques for quantum computers is an important task for programmers and other specialists. Quantum entanglement and phase compensation open up fundamentally new computational possibilities. Thus, the prospects for the development of methods of quantum chemistry are the increase in the efficiency of algorithms and multiprocessor calculations, the application of quantum chemistry to systems containing thousands of atoms, and the solution of applied problems in physics and chemistry.

SIC Technological Nostalgia and Postindustrialist Idealism

Location: H 14

Organiser: PC

Chair: Roine Viklund

The Kind of Problem Innovation Is:

Tracing the Intellectual Contributions of Jane Jacobs outside Urban Planning

Ms. Joanna Szurmak

*This paper outlines research into the influence of the work of urban theorist Jane Jacobs in economic thought. The conference theme of interplay between technological innovation and society is highlighted in Jacobs' second book, *The Economy of Cities* (1969), where she proposed a theory of economic development through urban technological innovation. A dense, diverse urban setting played a central role in catalyzing the reaction between a city's social capital and its economic activities. Innovation was key to Jacobs' understanding of the economic forces driving urban development and prosperity, and innovation not only depended on, but also unleashed, technologies that had a profound impact at all geographic scales, changing social conditions along with the economic ones. Jacobs, an outlier in the literature of both urban and economic development, envisioned economic and technological forces as interdependent on urban social capital. While Jacobs' insights have left a legacy in urban planning, scholars have mostly neglected their economic impact.*

This paper also presents intellectual history of some profoundly interdisciplinary work by a non-economist in a discipline hostile to outsiders. Quantitative data from bibliometric analysis and textual analysis are used to recreate the origin and influence of Jacobs' contributions. Success is a matter of reconstructing two sets of networks: the one that enriched Jacobs' ideas, with input from figures such as Nobel laureate Wassily Leontieff, and the one that was fuelled by Robert Lucas' 1988 "discovery" of

Jacobs' externalities and their subsequent life-cycle through the literature of technological innovation in economics.

Seeing the Past in Stages: Stagecoaches and Freight Wagons as Frontier Nostalgia in Western Canada, 1910–1960

Dr. Ben Bradley

Canada's far west was widely regarded as one of the last North American frontiers at the turn of the last century, but its economy and social geography would be radically transformed by railways, automobiles, and improved roads during the 1910s and 1920s. Their proliferation, and the commensurate decline of horse-drawn conveyances and inland steamboats, also generated new ways of thinking about community, progress, and the past. This paper explores how the modernization of overland mobility in western Canada drove a popular nostalgia for the transportation technologies and travel routes of yesteryear.

At the same time that the speed and carrying capacity of railways was putting competing modes of overland freight transport out of business, automobiles were allowing travellers to relive some of the temporal and spatial experiences seemingly "annihilated" by such modern systems. Motoring came to be closely associated with anti-modern activities, such as nature-viewing and the contemplation of historic landscape features. The flexible travel patterns permitted by the automobile also sharpened competition between businesses and community boosters for the attention (and custom) of the motoring public with historically-themed imagery and artifacts, stagecoaches and freight wagons foremost among them.

During the interwar years, old coaches and wagons were preserved, restored, and displayed in many western Canadian communities. Made of wood and leather, these horse-drawn vehicles came to symbolize the region's (relatively recent) frontier and pioneer days as distinct stages in its development. For promoters, these antiques were effective because they were regionally distinctive yet recognizable within North America's broader enthusiasm for 'Wild West' themes. For popular historians and many ordinary residents of western Canada, they offered, by way of contrast, a potent illustration of the region's material progress as manifested in good roads, technological advancement, and an active, modern state. Drawing on a wide range of written, material, and visual sources, this paper traces the emergence, proliferation, and persistence of a "horsepower nostalgia" and popular interest in old wooden vehicles in westernmost Canada, demonstrating close linkages between technological nostalgia, modern automobility, and a mid-century tendency to perceive history as occurring in stages.

History of Lifts In Poland – Development of Lifting Technology and Protection of Technical Heritage in the Context Of Contemporary Security Requirements and Regulations

Ms. Katarzyna Pietrzak

The main purpose of the paper is to pay attention to historic lifts as valuable cultural heritage. The development of lifting technology is associated with searching for solutions for enhancement of safety of vertical transport. There were two groundbreaking innovations in this field, that have changed the world. Safety brake invented in 1853 by Elisha Otis, and first elevator driven by an electric motor, constructed in 1880 by Werner von Siemens. Thanks to them building high-rise buildings and skyscrapers became possible. Historical lifts are often characterized by high aesthetic value. For years they have been used by people in factories, public and residential buildings. They are a document of history that brings closer the everyday life of the inhabitants of industrialized cities. For the last two decades many valuable historic lifts in Poland have been removed and destroyed. Administrators have replaced them by new ones which use higher safety standards and modern technologies. But it is not the only solution. Preserved elevators from the beginning of the 20th century are already unique objects. Some of the ‘survived’ ones from Poland are presented in this article. They undoubtedly deserve individual conservation protection. Of course it should include the maintenance of decorative lift shafts and cabins, but the original elements of propulsion mechanisms are even more important in this case. Those devices present the subsequent stages of technical development. That is why it is so necessary to start dialogue and cooperation between conservation and technical supervision offices. It is also important to involve technical universities and contractors.

STID Social Values Matter: Biotechnology and Medical Technologies

Location: H II

Organiser: PC

Chair: Anne MacLennan

Stubborn Technology: Barrier Contraceptives in Twentieth-Century American History

Dr. Donna Drucker

“Stubborn Technology” traces the shifting technical, political, and gendered landscape of three types of non-hormonal contraceptive technology for women: the diaphragm, the cervical cap, and spermicides, commercial versions of which were available in the late nineteenth century and have ebbed and flowed across the contraceptive landscape ever since. The main argument is that research on, along with the availability and use of, non-hormonal contraceptive technology for women reflects broader American viewpoints about women’s freedom, their sexuality, and the roles of government regulation and scientific research in shaping their life decisions. The availability of technologies related to fertility and contraception alike, when all who need them are able to choose them freely, is an expression of women’s value in American society—indeed, an expression of societal commitment to reproductive justice.

This paper develops a concept of “stubborn technology,” a technology that despite its flaws remains an ongoing part of the sociotechnical landscape over time. “Stubborn”

refers to both the users who favor the technology and to its historical longevity. Marginalized individuals and groups favor such technologies even in the face of opposition from medical or legal professionals. They continue to support use of the technology even if improved alternative versions exist. A stubborn technology receives criticism or condemnation from traditional forms of authority but nonetheless retains value, often symbolically as part of the rejection of that authority. The cervical cap, diaphragm, and spermicides are all stubborn technologies, as different actors (including birth control activists, pharmaceutical and manufacturing companies, users, and feminist health activists) reimagine, remake, and regenerate them repeatedly through the twentieth and twenty-first centuries. This concept illuminates historical patterns of user interactions with, and modifications of, body-oriented technology. Contraceptive manufacturers and users are locked in a process of continual co-evaluation and co-creation.

Ear Trumpets: The Obsolete, The Nostalgic, The Protective
Dr. Magdalena Zrodowska

Throughout the 19th century ear trumpets became the most popular and in fact the only solution for deaf people apart from highly invasive and painful medical procedures. They merged with the behavior regarded as typical for the deaf such as misinterpretations and communicational loss, therefore ear trumpets turned into a social stigma. They became objects that were bashfully hidden by users.

In my presentation I consider how ear trumpets' image as well as functions changed in the 20th century, when they were substituted with modern, electric and later electronic hearing prostheses. Once ear trumpets became antiquated their place in the technological landscape have changed. They did not vanish but relocated within the social and cultural domain. I will concentrate on three new contexts of ear trumpets' usage:

1. The obsolete

At the beginning of the 20th century ear trumpets became outdated overnight, and seemed to have lost a game with modern electric aids. I will analyse the ways ear trumpets' manufacturers tried to find new strategies of promoting them, and consider why these archaic devices came back in the 1970s as a specialized medical equipment.

2. The protective

It seems a rule that the direction of innovative flow leads from the military industries to the everyday life. Once the conflict is over the military technologies find their way into the civil practices and usages. In case of ear trumpets it is the other way round: obsolete in the civilian sphere ear trumpets proved their worth on the battle fields of the 1st World War being used as an element of the anti-aircraft protection system – both mobile at the front as well as large scale and concrete, along the British coastline.

3. The nostalgic

Once out of everyday usage ear trumpets became the manifestation of the spirit and specificity of the Victorian era (the beginning of the modern project as well as mechanization) and the representation of the idealized past. I will concentrate on three examples of the contemporary nostalgic character of ear trumpets: the collecting practices (both institutional and private), the steampunk aesthetics, and artistic imaginarium.

SIE 13th Annual Symposium of the Social History of Military Technology 4

Location: HR 5

Organiser: Bart Hacker and Ciro Paoletti

Chair: Bart Hacker

World War I and the Improvement of the Italian Canal and Port System, 1915-1918

Dr. Ciro Paoletti

Italy started World War I with a dramatic need of raw materials, including one-sixth of her annual food consumption. All needed to be imported, mainly by sea. Moreover, the kind of war Italy had to fight by sea deeply differed in enemies and methods from what had been planned in the past. The port system had to receive goods from abroad and to share them among the nation, her fleet, the Allied fleets (notably French and British, but with a small Australian and Japanese presence too) and the Allied troops in the Balkans. Moreover, the maritime war theater was divided in two parts. A fighting theater in the Adriatic, and a supply theater that included the rest of Mediterranean, the Atlantic, and the Red Sea. The increased merchant traffic in some ports and the increasing presence of men of war in other ports required improvement of the port system. Some existing harbors were dug, widened, and were linked to the existing railway net. Other facilities were added, like broadcasting systems, additional storage, new telephone lines, new hospitals, hydroplane facilities, and so on. At the same time, the Navy had to support land operation from Venice eastward. This meant an improvement of both Ancona and Venice harbors, which were too shallow for the biggest ships of that time, and a complete restoration and improvement of the canal system between Venice and what was now the Italian-Austrian front, a system built by the Republic of Venice before the eighteenth century and completely abandoned by Austrian rulers in the nineteenth. All these works improved substantially the Italian port system, which had a remarkable influence on logistics and on operations. It also remained as a major wartime contribution to postwar Italy.

Gender and the Gun: Feminizing Cannon in the First World War

Researcher Bruno De Corte

War is not gender-neutral. The public display, the threat or actual use of weapons is an intrinsic part of violent, militarized models of masculinity. Yet large guns have – in the late Middle Ages and in the opening decades of the twentieth century – often been feminized through nicknames. As such they constitute an intriguing case of how gendered language plays an instrumental role in warfare.

The first cannons cast in medieval Europe were impressive and highly expensive weapons that quickly had an impact on popular culture. Soon female nicknames appeared: Dulle Griet, Mons Meg, Faule Mette, Faule Grete. This practice was, however, discarded once these early guns became obsolete. Due to the emerging industrialization, large guns reappeared during the American Civil War. Less than twenty years later, Krupp was able to produce a 100-ton gun. While ever-bigger guns fired at ranges that they were no longer visible to their targets, the highly mediatized Second Boer War saw the resurgence of nicknames for heavy artillery. In the First World War artillery dominated the battlefield, causing over 75% of casualties. Coping with this new and brutal reality, the masses of soldiers developed a particular slang in which they doted large guns with feminine names. The best known of these, Big Bertha, has entered popular culture forever.

By playing on sexual stereotypes the brutality of the war was reduced significantly. To the soldier, it seemed less dangerous or life threatening. Using sexual metaphors helped to glamorized military action by promoting a false sense of excitement as well as willingness to support the idea of weapons used within the military. Where the common soldier was dehumanized by modern warfare, the technology of war became increasingly “human”.

Designing with Purpose: Human Factors Engineering in NASA

Dr. Layne Karafantis

Human factors engineering professionalized in the early years of the Cold War due to the development of safety-critical systems—those in which failures would be catastrophic. Often used interchangeably with ‘ergonomics,’ human factors engineering (HFE) not only considers physical comfort in the composition of objects and systems, but seeks to optimize human performance through strategic design principles drawn from psychology, cognitive science, and other fields. The origins of HFE are typically traced to Taylorism, but it was not until the Cold War era that the field became widely researched and implemented in a variety of areas. The American military long held interest in HFE. Earlier called ‘applied psychology’ or ‘human engineering,’ branches developed tactics to improve selection and training techniques; in later years, engineers employed research in the construction of weapons systems and command rooms. By the 1960s, largely due to Cold War imperatives and the development of new computing and communications technologies, many federal, company, and university laboratories were conducting HFE research in efforts to

better understand man-machine interactions. NASA, an agency itself borne of the space race between the United States and Soviet Union, has been a key contributor to the development of human factors engineering. Along with pioneering biomedical studies necessary in determining how man would physically venture into space, NASA investigated how displays and controls needed to be placed aboard spacecraft so that astronauts would be best able to process complex information and complete tasks. NASA's early studies in human factors helped lay the foundation for what has become an enormous field used in a number of arenas, and advancing human-machine performance remains at the forefront of its research agenda.

SIF Digitalisation: Revolution of Contemporary History

Location: H 26

Organiser: PC

Chair: Heike Weber

Magical Things. Demons inside the Machine

Dr. Heiko Schmid

To put the idea across how contemporary technology is changing contemporary societies, it is a beneficial approach to analyze contemporary fictional (science fiction) literature. For example, in his book "Snow Crash" the author Neal Stephenson uses the comparison of ancient language with code to clarify, that digital technologies made language "magical" (again) - that by relying on the potentials of algorithmic machines, code became a magic "language" able to change our realities. The author Hal Duncan (comparable to Stephenson) describes reality in his book "Vellum" as substantiated by an antique language he calls the "Cant". This Cant offers antique beings living amidst ourselves the possibility to constantly re-program the present time. Duncan: "But eternity, the Vellum, is like ... the media of reality itself, the blank page on which everything is written, on which anything can be written."¹ In my proposed paper, I want to use these two examples as a starting point to discuss, how digital technologies and especially new digital assistants like Siri or Alexa are re-introducing the concept of "magic" as a key driver in our contemporary societies. By dealing with "interactive real-time interfaces" the user in our times constantly programs his machinic assistants (computer-demons), thereby producing a network, that supports him – a network that, to a large extent, begins to define his reality. As Luciana Parisi highlights, this constant interaction with algorithms produces unpredictable quantities and outputs.² Our new digital assistants so are not functioning in quantifiable structures anymore - they constantly create unpredictable outputs in reaction and in adoption to the immense data stream they are confronted with. As I hence will argue in my proposed paper, is, that these days the unquantifiable, the unpredictable gains momentum in our societies. One could speak in this context of new digital actors / new machines re-defining our reality as magic. The proposed paper will depict the framework of an exhibition / research project, which just now installed installed in a cooperation between the Zeppelin University Friedrichshafen and the Museum Angewandte Kunst Frankfurt am Main.

***Digital Technologies and Sociotechnical Barriers:
Some Lessons from the Soviet Experience***
Researcher Liliia Zemnukhova

Digital technologies disseminate and are implemented in a complex way facing diverse barriers on their way to users. Today's Russia strives for the digital economy, which requires massive science and technology development as much as accumulated local and national (post-)Soviet engineering experience. While the global academic research of the barriers to the technological development was represented by the two major disciplinary fields – Innovation Studies (IS) and Science and Technology Studies (STS), – the Soviet research traditions followed their own, alternative paths. For example, theoretical aspects of sociotechnical barriers were elaborated within system analysis approach and other interdisciplinary collaborations based on the intersection of engineering and social sciences, cybernetics and hard sciences with a focus on system theory. At the same time, practical dealing with sociotechnical barriers was undertaken and driven mainly by the specialists in ergonomics, engineering ecology, and organizational psychology. The purposes of the talk are to highlight the main lessons from the late Soviet theory, methodology, and practice of overcoming sociotechnical barriers; to trace their transformation and perspectives in the contemporary process of digitalization in Russia; and to introduce some empirical findings of IS and STS application in contemporary Russian technological context.

***Passing the Power: Guardians of Journalism Production Expertise at
U.S. Newspapers, 1975 – 2015***
Dr. Susan Keith

This paper reports on research that aims to understand the role news production technologies played in the structure and function of newspaper newsrooms in the United States between 1975 and 2015. This period—in which newspapers moved from being dominant and financially secure media to financially troubled entities struggling to earn profits from print and the Internet—was one of computerization and, ultimately, digitization. So this presentation seems appropriate for the “Digitization and Computerization: Technological Trends and Social Effects” stream. While my expertise is in the U.S. case, I understand that similar transformations affected journalistic production in other areas of the world and that what happened in the print news industry mirrored computerization and digitization in a host of other industries, which I hope to learn more about at this conference.

*This paper, which builds on my previous work on the technology of newspaper copy editing/sub editing, expands that scholarship to look at the role of evolving design technologies in newsrooms (first proprietary computer systems, then off-the-shelf technologies, such as QuarkXPress and Adobe InDesign). It reports on data gathered from journalists' autobiographies/memoirs and from discussions in the trade press, principally *Editor & Publisher* magazine, once known as “the Bible of the newspaper*

industry.” I attempt, drawing on theories of organization change and deskilling, to construct a narrative of how the introduction of new technologies created cascading loci of power and job security in newsrooms, as first one group and then another acted as guardians of expertise with new tools.

***From Kodak to Instagram:
How Analog Photography Created Visual World
Ph.D. candidate Nevena Ilic***

Invention of photography was one of the greatest patents in the 19th century. With its industrialization, at the begging of the 20th century, it created an entire new spectrum of a visual world where we continue on living. Nowadays, 95 million photos per day are uploaded on Instagram, the giant in the virtual photo world, the largest photographic based social network that brings together millions of users and fans of photography in the digital mode. More than one hundred years ago, George Eastman, as a result of his invention to capture light on photo sensitive material (celluloid film), created the photographic industry, based on chemical processes – what is called, from today’s perspective, analog photography. The industry of the photographic film and machine allowed us to reach unsuspected level for the use of it, and the possibility that all men become photographers. It has allowed us to watch, document, educate and depict ourselves in the field of art, journalism and science. It became our cultural and historical memory. In terms of the conference theme, this paper aim is to explain how industrialization of photographic media with help of new technology in early 20th century, created pattern of visual world in which we live in present moment. The study examines the history of the analog photography, the achievements in the fields of science, technology, technique, advertisement, design, art and journalism.

***StG Search for Pure Potable H₂O:
Development of Water Supply Systems***

Location: E IIA

Organiser: PC

Chair: Eike-Christian Heine

Technological Advancements in Filtration Techniques in the Early Modern Period

Dr. Suryyia Manzoor

A considerable historical development in the water purification techniques presents the cognizance of human race towards the prominence of pure water. The early purification techniques were based on the removal of turbidity which caused cloudiness and unfavourable taste. Yet, the water could be contaminated with various pathogens and organic /inorganic pollutants. This led to the need of designing more

efficient water purifying systems, among which filtration received significant attention due to its simplicity of application.

The concept of water filters received fame in 17th century when Sir Francis Bacon conducted his experiments for water desalination by means of sand filters. With the passage of time, various innovations were made to improve the performance of filter systems. Slow sand filters were introduced by early 18th century and were successfully incorporated in Europe and some cities of United States. By that time, these filters were regarded as the most efficient mechanical means of purifying turbid water. However, the presence of pathogens in water was still an unknown fact and several communities suffered through outbreaks of water borne diseases resulting in high mortality rate. In 1885, Louis Pasteur made a foremost discovery by establishing the role of germs in causing diseases which was a major breakthrough in the area of water purification. Hence, the designs built in the early 20th century focussed also on removing microbial contamination that led to the diseases like cholera, typhoid and dysentery. The paper thus focuses on the technological developments in filtration methods that occurred in the course of time to improve the quality of potable water. These advances were predominantly based on the types of filters to remove target impurities as well as engineering designs to enhance the compactness of the filter plants.

Technological Advancements in Ancient Water Systems of Balochistan
Ph.D. candidate Muhammad Sohail

In this article, I talk about one of the most vibrant and ancient water systems of the world in general and particularly in Baluchistan, Pakistan i.e Karez, their technological developments through different time frames and supplementary systems introduced in the modern time to augment the supply of water in dry regions. Karez is old and stable irrigation system of Balochistan, Pakistan.

Balochistan is one of the driest provinces of Pakistan with an average humidity of 40% and suffers frequent droughts. The local community has relied predominantly on Karez system through centuries and the ruins of various ancient karez can still be found in different parts of the province. Karez system is still well owned and has gone through prominent modern technological advancements in terms of construction and working during last few decades. However, parallel frameworks to dispense water like tube wells and dams are competing for this ancient water supply system rapidly after the green revolution in Pakistan. Hence, the article also encompasses a comparative study towards the success of ancient and modern water systems.

Community-based enterprise is managed and run by tribal traditional and social control respectively. The spacing of karez, their types, life length, discharge, land development and allocation of water distribution and management are important aspects of karez. Furthermore, the impact of socio-economic condition of karez is also studied.

History of Methods and Technologies of Water Purification in Institutes of NAS of Ukraine

Ph.D. candidate Mariia Stankova

The Institute of colloid chemistry and water chemistry of the National Academy of Sciences of Ukraine was established in 1968. Since 1980 the institution has been named after the academician of NAS of Ukraine A. Dumansky. In 1965, the Department of Chemistry and Water Technology of the Academy of Sciences of the USSR was organized on the basis of a group of laboratories. From 1970 - 1971 a cycle of works related to the development of the proposed academician of the Academy of Sciences of the USSR L. Kulsky classification of impurities of water by their phase-dispersed state begins.

In 1940 at the Institute of General and Inorganic Chemistry them. V. Vernadskii of the National Academy of Sciences of Ukraine conducted systematic research in the field of analytical chemistry and developed the basics of physic-chemical analysis of solutions. In 1949 the technological regime was developed and the production scheme of water purification by coagulation was proposed. In 1950, the Institute carried out work to improve the technological scheme of water purification through adsorption.

The history of the Institute of Hydrobiology begins in 1909 when the Dnipro Biological Station. In 1968, the Institute studied the role of microorganisms, the activity of the microflora of soils and the conditions conducive to strengthening the processes of self-purification.

The basic methods and technology of water treatment, showing their advantages and disadvantages. Scientists analyzed the achievements in the field of drinking water and current trends in the industry, namely E. Oppokova, E. Topachevskoho, A. Lidov, I. Horonovskoho, F. Ovcharenko, A. Pylypenko, L. Kulskiy, V. Goncharuk, V. Romanenko, A. Denisov, L. Zhuravlev, Y. Zaitsev.

SIH Unusual Sounds: Girls with Electric Guitars, Finnish Synthesizers and New Issues in the Development of Computer Music

Location: E IIB

Organiser: Hans-Joachim Braun

Chair: Stefan Krebs

Garage Girls all over the World Playing with Sound and Technology in the 1960s

Professor Susan Schmidt Horning

This presentation explores the global phenomenon of all-girl rock bands in the 1960s. Based on oral interviews with surviving band members, memoirs, sound and video

*recordings, photographs, archival materials, and histories of technology, popular music, gender and media studies I argue that this study promises to shed new light on the history of adolescent girls and young women and their engagement with rock culture decades before the explosion of punk and Riot Grrrl culture in the 1980s. In the postwar era they defied parental expectations, rejected gender norms, and embraced what has historically been considered culturally and technologically the domain of boys and men. Girls were not just responding to musical culture in the 1950s and '60s, as Susan Douglas argued in *Where the Girls Are*, they were making it.*

This is a crucial and overlooked aspect of rock music culture, women and gender studies, and the gendering of technology as these bands proliferated before there was a fully developed rock music media or an overtly masculinized rock music culture. It reframes the notion that guys were the only ones picking up electric guitars and forming “garage bands” after they saw The Beatles on Ed Sullivan in 1964. Girls were doing that as well, not only in the U.S., but also in the UK, Europe, the Nordic countries, Serbia, India, and Indonesia. Their stories promise to reconfigure our understanding of women’s and young girls’ embrace of technology and power in electrified music making on a global scale.

Erkki Kurenniemi's Electronic Musical Instruments and their Role in Electroacoustic Music in Finland during the 1960s and 1970s

Researcher Mikko Ojanen

My thesis concentrates on the work of musical instrument designer Erkki Kurenniemi (1941–2017) and his role in the development of electroacoustic music in Finland during the 1960s and 1970s. In the local context, Kurenniemi was an exceptional figure with his utopian visions of the future and unique designs which started as a DIY hobby and slowly grew into a small size technology enterprise. His work provides an excellent point of departure for analysing how the music technological designs of one man influenced the sound of electroacoustic music in Finland for almost two decades. However, I will challenge the simplistic depiction of him as a genius working alone in his laboratory and contextualise his work on both national and international levels.

The project employs rich source material which consists of the historical magazine articles and documentary material, the large body of oral history material both contemporary interviews and those conducted during the current project, Kurenniemi’s musical instruments and their mainly handwritten documentation, the original master tapes of musical works along with recordings of improvised performances, instrument tests, and audio diaries from Kurenniemi’s private collection.

In conclusion I will recognize the key actors of the music technological development and how they interact with each other. For example, an exceptional actor in the local context becomes typical when contextualised on a global level; many designers working independently developed resembling projects during the 1960s and 1970s. Furthermore, despite his exceptionality on the local level, Kurenniemi did not develop

his designs in a vacuum but his social context both facilitated and hindered his work. On the one hand, many of his unique instruments were realized in a close collaboration with artists who commissioned them, on the other, commercialising or domestication of Kurenniemi's instruments never happened partially due to the lack of user experience utilization in the project development.

Images and Utopias of the Digital Musician in the History of Music Software

Researcher Andreas Möllenkamp

In the history of music technology, new musical instruments often were charged with futuristic images and utopias of new musical worlds. Constructed by its producers, the media as well as popular musicians, these images are part of the dreamscapes of their time and shape the diffusion and appropriation of these instruments. As a dominant process of the past decades, digitization has not only led to a comprehensive transformation in the everyday use of music, but has also changed the way music is made. Today the use of digital media in music has become a daily practice and often a necessity. How did the computer become a musical instrument? And which images and utopias were associated with »digital musicians«? By analyzing the design of music software applications as well as magazines for musicians from the 1950s to the present this paper describes the change as well as continuity of what constitutes a digital musician. Being seen as a universal instrument promising unlimited aesthetic possibilities and a democratization of music culture, the computer challenged the very ideas of artistic creativity and virtuosity as well as the relationship between man and machine. At the same time digital music production stayed a predominantly white and male domain. From the musicians' point of view, digitization did not lead to the emancipation from the music industry, but played a role in the continuation of precarious working conditions as well as growing expectations of self-promotion.

Computer Music and Improvisation: A Contradiction?

Professor Hans-Joachim Braun

Improvisation refers to processes that are spontaneous, original and often useful. They are valued highly, not only in jazz, theatre and dance, but also in engineering design, product design, and architecture or in management and related fields.

At first glance, improvisation seems to be completely alien to computer music. Whereas the latter is based on algorithms, often enriched by chance elements, improvisation despises predetermined solutions. But a closer look reveals that a computer can offer an enormous range of variations, useful for improvisatory practice. It is also not subject to the constraints of the human motor system.

Composer's attempts to introduce improvisation into computer music have been with us for more than two decades. In this context, the use of "live algorithms" with their

capacity to invent, provoke and respond, of cellular automata, or of particle swarms and neural networks have been of interest. “Musebots” and improvising robots playing marimba have been devised.

In my paper I will deal with the discourse on and practice of computer music and improvisation. My source material consists of articles by computer music composers and I will explore the issue from the point of view of the history of technology and of technology - music relationships, an approach, which is still missing in the literature. Also: Avantgarde and experimental practices in the arts have sometimes served as a laboratory and inspiration for innovations in fields such as architecture or engineering design. Transferring this to the topic of improvisation and computer music: can the attempts of using improvisation in computer music be regarded as an inspiration for advances in related areas of AI and robotics?

Saturday, 11:00 – 12:30

S2A Sustainable Buildings and Innovations 2 (in French)

Location: H 21

Organisers: Richard Cantin and Pierre Michel

Chair: Richard Cantin

Wearing the Machine: Technological Evolution from Transportable to Wearable Machines

Ph.D. candidate Nada Ghribi

In the fields of manufacturing, medicine or communications, we are more and more often brought to handle, transport or get equipped with machines. For reasons of transportability, in addition to performance, technological research has focalized in the last decades on the miniaturization of electronic solutions.

One of the main focusses of the contemporary era is to compact technologies in order to facilitate their use and manipulation. The reduction of size makes it possible to design materials integrating electronic devices within the material itself. Today, there is a wide range of materials with embedded electronics called smart materials.

In the field of textiles, the ambition was to integrate the machine in the garment without altering any of its characteristics. Indeed, the concept began in the 90s through a collaboration between Levi's and Philips aiming to create a jacket with integrated electronics. The numerous pockets allow to carry a set of electronic devices and the electric wires stitched within the garment permit to connect them to each other and to the battery. The researches were since then developed to create what we called wearable computers.

Today clothes incorporate micro machines and electronics without altering their textile quality thanks to the technological evolution and the creation of smart textiles. The lightweight, non-bulky and ergonomic wearable computers enable more accurate medical diagnostics, facilitate communication while offering wide possibilities in the field of workwear and well-being.

In this paper, the aim is to highlight the impact of technological change on the creation of smart textiles and subsequently connected and communicating clothing. This will be based on the wearability of the machine, its usefulness and the possibilities of its use in various fields. First, we will study the technological evolution towards the miniaturization trend of electronic solutions over time, especially computers. Then we will focus on the case study of the collaboration between Levi's and Philips as a pivotal project that marks the transition from the transportable device to the wearable one. Finally, we will study wearable technology and its possibilities of use in different fields such as health and well-being, sports, work or communication.

Influence of BIM-related Digital Technologies on Real Estate Management

Ph.D. Candidate Xin Gong, Mr. Pierre Michel, Dr. Richard Cantin

Since 1980s, Information and Communication Technologies (ICT) has influenced the building sector, impacted the organization of its management and expanded its market. In this new part of the market, technologies influence the price constitution of the real estate, computing in the building (computerization, networks engineering, new hardware and software, construction robots, professionals, standards and regulations), home automation (myth of the robot house, services, technical aspects).

The digital economy for the building sector is developing with BIM (Building Information Modeling): a digital representation of physical and functional characteristics for an installation or a building. In addition to a 3D digital model, the digital representation is enriched with detailed components and it modifies the relations among the building stakeholders. The explosion of BIM data is generated by Computer Aided Design, digital notebook, laser scanner, 3D printing, 3D virtualization, Augmented Reality, Virtual Reality, digital models and libraries, pattern models, simulations ... These digital technologies support each other according to each one's competences and characters, but they are being evolved also because of the existing competitions between one another when it concerns to ensure a similar competence.

In the building sector with all these trends of these different technologies, real estate professionals and managers are faced with the multiplication of new service offerings and are wondering about the integration and use of such BIM-related digital technologies. To better achieve this transition, some pioneers have already begun theoretical and practical research, experimental projects... For example, in France

since 2015, the *Plan de Transition Numérique dans le Bâtiment*¹ aims to accelerate the deployment of digital tools with 3 objectives:

- Experiment, capitalize, convince and promote the appropriation of digital in the daily act of building;
- Allow the building professionals augment their skills around digital and the development of tools adapted to all projects especially in popularization goal;
- Develop a trusted digital ecosystem to encourage standardization work and to enable the interoperability of tools and software.
-

This paper presents a brief of BIM evolution and the emergence of digital technologies. It focusses on the BIM-related technologies especially on digital transition and interoperation which influence the real estate management. This influence of BIM-related technologies can be modelled by a metric system developed from surveys as well as analytical and systemic approaches.

Comments

Mr. Mohamed El Mankibi

S2B Turns in the Energy Supply: Past, Present and Future 3

Location: H 13

Organiser: Timo Myllyntaus

Chair: Nelson Arellano

Greenpeace and its Anti-nuclear Campaigns in Brazil, 1991 – 2011

Ph.D. candidate Marly Kamioji

The Greenpeace Brazilian office was founded in 1992 following the UN Rio Conference when environmentalism was at its peak in the country. Its first action was a protest against the Angra nuclear power plant, where the Greenpeace activists stuck 800 white crosses to symbolize the number of deaths in the Chernobyl accident, which is controversial once UNSCEAR (2000b) and the UN Chernobyl forum documents (2006) reported different number of deaths from that accident. At first, they were successful in portraying the nuclear energy as a risky and destructive source of energy, but according to Camargo (2000) he succeeded in reversing the dismantling of the nuclear sector and completing the Angra 2 plant construction. Goldstein (2017) confirms that Camargo managed to defeat Greenpeace and says that as a consequence the local anti-nuclear environmental activism almost disappeared allowing Brazil to pursue the construction of a third nuclear power plant even after the Fukushima nuclear accident. Before that accident, in 2008, Greenpeace appeared in the media to report that the underground water near the uranium mine explored by the Nuclear Industries of Brazil (INB) in Bahia state was contaminated by uranium. The uranium extracted from that mine is for the production of nuclear fuel used domestically in the

¹ Digital Transition Plan in the Building. Progress Report March 2017 and website www.batiment-numerique.fr

nuclear plants, so that was an indirect attack to the nuclear plants. The communication advisor of the National Committee of Nuclear Energy (CNEN), Helena Beltrão (2017) describes the publicity campaign and the communication and marketing strategy the Greenpeace organization used against INB as meticulous and says the information released by Greenpeace about the water used for consumption being contaminated was false. The population was afraid of drinking water and getting cancer by the radioactivity and together with Greenpeace and the media they exerted pressures during the public hearing promoted by the public Ministry of Bahia.

Science, Energy and Knowledge: An Analysis of the Scientific Literature on the Synthetic Fuels Production Technologies in the 1970s and 1980s in the United States

Dr. Francesco Gerali

Research breeds research. When the environment (politics, human and capital resources, and the demand for the good) is right, research activity compounds itself. The growth rate continues until research activity is at the limiting level, which its environment can support. However, what influences the workflow of the research, and what is the limiting level? Does there really exist a breaking point where scientists gives up discouraged by the surrounding and overwhelming odds? This presentation aims to document the trend of the American scientific research on synthetic fuels production technologies between 1972 and 1988. The goal is to understand if the environment has really influenced the research; and, whether it is possible to determinate or not a precise breaking point in the flow of the research. The research is born from the idea to merge together history of science with a bibliographic study, to gain a better understanding of the publication trends of the literature produced about the research on synthetic fuels production technologies in the United States during 1972-1988. The quantity and the quality of the bibliographical records consulted for this study (a total of 9,317 books, journal articles, conference reports, technical reports, thesis/dissertations, and patents) is used as point of reference to enhance the understanding of the trend of research in the historical context of the time. The conclusions reached in this study are based on the comparison of historical facts through the lens of a bibliographic study on the contemporary technical-scientific literature available from the United States Department of Energy.

A Positive Example of the Operation of Binomial Political Authority – Powerful Technologies: Renewable Energies in the Period of Totalitarianism in Romania

Professor Victoria Cotorobai

The Communist regime in Romania, with totalitarian power tools, had notable achievements in important areas for the development of Romanian society: education,

electrification, road infrastructure, Danube-Black Sea waterway, housing, industrial development and all.).

In the paper, we will stop on the development of strategies / policies / actions for capitalizing the renewable energy resources / RES on the Romanian territory. The Romanian energy potential of these resources is impressed: geothermal (4th place in Europe); Water; solar (8th place in the world); biomass.

Considering this potential and the national context during the great energy crisis of the 70s (Romania had begun to be dependent on oil and gas resources), the Romanian energy specialists devised plans to develop the systems of valorization of RES (units of prospecting and evaluation, production of equipment, research and development in the field, recovery systems).

The paper will highlight some of Romania's concerns and achievements in this field and will analyze the impact of totalitarian political power and multiple cooperation mechanisms on technology development in Romania.

We will stop on: a) Certified specialists: Dorin PAVEL, the parent of the Romanian hydroenergetics (application in the Iron Gates Hydroelectric Project, the Bicaz dam); Vladimir Fara, Viorel BĂDESCU with their concerns in shaping and simulating solar radiation, conversion equipment, or formulating the principles of passive houses; Coleta de Sabata with solar energy concerns; David Perentz, Jan d'Albon with their concerns for the optimization of solar energy conversion equipment; b. examples of hydropower plants (Iron Gates, Sadu Complex, Bicaz); c. examples of economic units producing solar energy conversion equipment (IAA Alexandria); d. examples of centralized hot water systems for housing assemblies (Iași: 830 apartments) and tourist units on the seaside; e. solar energy recovery systems; f. solar houses; g. research and development institutes in the field - ICCPDC, INCREST.

S2C Tourism – What Can History of Technology Contribute?

Location: H 14

Organiser: Stefan Poser

Chair: Per Lundin

Touristic Space for a Deprived Period: Showcasing a Chapter of the History of Iron Technology in Ancient Gaya/Kaya, South Korea

Professor Constantin Canavas

Tourism increasingly becomes a space of intriguing representations of ancient technology. The present study focuses on a particular “culture of iron technology” in Ancient Korea and its current representation in terms of exhibitions, cultural activities and touristic programmes.

One of the most spectacular exhibit groups in South Korean museums are plate armours, helmets, and swords made of iron, typically dated to the 4th-6th century CE and mostly found in tombs. The generic cultural attribution is Gaya/Kaya – a name used collectively for “a loose federation of states” which would have been absorbed by the expanding state of Silla between 532 and 562 CE. The established historical narrative characterises the period between the 3rd and the 7th century CE roughly as the period of the Three States: Koguryo in the North, Paekche/Baekche in the Southwest, and Silla in the Southeast. The representation of Ancient Korea in the South Korean museums and standard books of history is built on the grid of relations between these three powers (“kingdoms”) with phases of (regional) dominance of each one – however, there seems to be no slot for a dominant political presence of Gaya/Kaya. Gaya’s presence just accompanies the Three States by its spectacular iron culture brought to the light out of majestic tombs.

The present study claims that the historiographical “squeezing” of Gaya/Kaya culture aside the mainstreaming of the Three States is related to the efforts to reconstruct a continuous historical narrative of politically and militarily leading states for a diachronically homogenous population on the Korean peninsula. The showcasing of the iron armour finds (including performances of experimental archaeology) during the last years detaches the artefacts from the historical context and facilitates the touristic “upgrading” of ancient technology, as well as the propagation and popularisation of novel national symbols of past power and present prestige.

Confronting Class: the American Motel in Early Post-war Sweden

Dr. Per Lundin

In Swedish tourism discourse, the car-centred American way of life was by the mid-1950s met with enthusiasm. In the case of accommodation, it was above all the motel that served to symbolise the positive values associated with the American model of modernity. The great expectations placed on the motel did not materialise as anticipated, however. In fact, already by the early 1960s, the motel had been brought into disrepute, and it would remain a marginal phenomenon in Swedish auto tourism. This paper singles out class as one of the decisive factors for this change of events. The tourism discourse was dominated by the bourgeois middle classes, and only a few of the Swedish motels were built to meet their expectations. The majority offered instead basic lodging for truck drivers, an occupational group embodying a working-class culture that many placed at the very bottom of the social hierarchy. The motel thus materialised in two entirely different cultural and social settings, and it developed into an arena for cultural class-related confrontations. Middle-class dreams collided with blue-collar realities, and in this clash, the discontent latent in great expectations became manifest.

Technological Heritage: Question its Role in Tourism and in the Emerging Museums of the 21st Century

Dr. Maria Sampaio da Luz

In Portugal, from north to south, we can find a different generation of hydropower plants in the main rivers, some of them closed and abandoned, waiting for new investments and reuses. Nowadays the heritage connected with water and hydropower is a significant resource to be revitalized and reintegrated in the network of renewable energy and could become an important part of touristic itineraries. This process should have a new framework within a museological project conceived in the study of the different components that encompasses a complete view of all the tangible and intangible heritage. We must emphasize the idea that museums, especially ecomuseums and social museums aim to use local heritage to promote local development (Varine 2002).

This article has the main objective of presenting two generations of hydro-electrical plants, located in Lindoso a village in the north of Portugal (near the border of Spain) and their potential to value the history of technology and its social actors.

Lindoso hydroelectric plant, built in 1918-1922, by the Spanish company Electra Del Lima, is the oldest hydropower plant of the region, (in Paradamonte - Britelo), and was once one of the most important hydroelectric power stations, but it is now closed and waiting for rehabilitation works. The other, a new hydropower project – Alto do Lindoso II (or Alto do Lindoso Dam), located 11 kilometers to the north, was designed in 1983 and completed in 1992. Nowadays, it is working regularly, and a powerful hydroelectric producer in Portugal.

Through the study of archival documentation and data related to the tourist activity in this region, we will present the touristic and cultural potential of these two plants, defending the idea that its preservation should involve all the social structures to get a sustained project. This case-study give us an important timetable of this momentum in the technology energy history and its social structures and also the opportunity to question its role in the emerging museums of the 21st century.

S2D Beauty of Products: Technology and Design

Location: H II

Organiser: PC

Chair: Layne Karafantis

An Emotional Tour of the Plart Collection

Ms. Pina Di Pasqua

Ms. Alice Hansen

Mrs. Antonella Russo

Plastic materials fascinated designers on many levels. The democratic revolution that plastics induced already starting from the 20s and 30s was congenial to the principle of democratization of Modernism. Furthermore, such new materials were elegant, practical and adaptable - compatibly with the production techniques available at the time - to the different shapes that a designer could conceive. Since the very first use of plastics in the world of design we can find an emotional use of these materials, as in the case of the decorative Celluloid see-through panels made by Eileen Grey. In commercial production objects too, made in materials such as Bakelite, Formica or Bandalasta, we can find emotional aspects: Brokes and Adams, for instance, promoted its products persuading customers with the variety of beautiful marbled and translucent pastel shades of Beatl, it being such stuff dreams are made on – dreams that last! In the period following the two world conflicts, materials such as acrylic, fiberglass, polyethylene and soft and rigid polyurethane foam revolutionized the production technologies, the aesthetics of our daily life and our relationship with objects. From that moment on, design, in addition to dealing with the shape of industrial goods, has been also involved in analysing the possible constructional and expressive applications of the new materials. Design therefore becomes a ground for comparison between research and social application; not infrequently emotions have a role in the designing of artefacts and they can sometimes be more important than the actual functional characteristics. The choice of materials often contributes to the sensation we have of the objects. The Plart Collection is full of examples of "emotional" objects: indeed mostly feelings and a sensorial approach led the collector Maria Pia Incutti in the research of the plastic lamps, boxes, jewels, lamps, chairs that are now part of the permanent collection of the Museum.

From Industrial Aesthetics to Design: the teaching of arts applied industry in Portugal. A case study – the Portuguese ceramics
 Professor Maria Helena Souto
 Professor Ana Cardoso de Matos

With the Industrial Revolution, the possibility of reproducing the objects became a new reality, who led the manual production to mass production, separating the creation of the production by the reorganization of the work and the use of the machines. Recognition of the importance of drawing teaching as a quality static factor of the artefacts wasn't new and since the late Eighteenth century it was a subject for discussion how drawing practice allowed that the mechanical tasks would produce more perfect and refine products, and hence more sought after.

Through the definitive implantation of Liberalism in Portugal (1834), we can analyse the first attempts to form a qualified industrial worker. In the territory of the relationships between Art and Technique, the history of ceramic production in Portugal during the Nineteenth century and in the early Twentieth century, particularly in the production of tiles in a semi-industrial or industrial way, involves an awareness of Industrial Aesthetic.

With the development of ceramics production and cities' gentrification, since 1840 the tiles cover the frontages of houses and decorates bakeries, dairies, markets, assuming the role of coat, that combines the relatively low cost, hygienic qualities and strengthens as well as the no less interesting aesthetic possibilities, potentiated by the option of choice offered to the commissioner on tiles often developed by unknown authors to the service of different factories. Also the development of a class of small manufacturers and retailers led the country to new consumption habits and gave rise to the appearance of tiles panels with an advertisement which gave stores a more personalized reading.

This paper intends to identify the origins of industrial design in Portugal attending to the following aspects:

- The evolution of the teaching of arts as applied to industry;*
- The parallels with industry and teaching experiences;*
- The case study of Portuguese ceramic industry and its materialization capacity.*

S2E 13th Annual Symposium of the Social History of Military Technology 5

Location: HR 5

Organiser: Bart Hacker and Ciro Paoletti

Chair: Ciro Paoletti

Studying Armor Penetration to Advance Organizational Need – Three Influential US and German Mid-WWII Studies-Compared

Dr. Yoel Bergman

During WWII, highly kinetic, metals-filled, anti-tank APS (armor piercing shells) were used extensively and upgraded, to penetrate ever stronger armors. A new APS minimal striking velocity for completely penetrating an armor plate at normal incidence was estimated from three easily observable factors: APS weight, diameter and plate thickness. Their values were entered into an empirical equation, formulized from other APS past results (DeMarre). Hoping for a more engineering based and productive designing, wartime military and civilian bodies carried various researches. Such were the three influential studies. With classical mechanics, they investigated forces and energies, creating DeMarre-like ideal penetration equations, containing traditional and new factors. Realistic situations were also discussed. All favored small replica studies, while still recommending large APS firings for final verifications. Underscoring their predictive limits, they endorsed further studies. Possibly for these limitations, their legacy was mostly theoretical. Empirical methods persisted on both sides. The first research, a mostly theoretical 1941 seminal analysis, was conducted upon US army's Frankford Arsenal request, by H. Bethe, later, a Nobel prizewinner. The second, by C. Zener, known in electronics and metals, followed US army's

objectives, theorizing, firing and filing reports during 1943-44. Zener investigated penetrations' various factors, recommending their values for design, where applicable. The third, by Krupp scientist H. Kratz, publicized in 1943, argued that existing theories and new APS projects with limited firings did not produce needed knowledge. He advocated systematic studies with inexpensive small replicas (US studies with replicas began in 1942, approx.). As Bethe before, Kratz found theoretically that replica conclusions validly apply to large APS, when tested at same APS velocity, and that extreme APS velocities are problematic. His innovative experimental data included replicas' momentary plate locations and velocities, while his ideal equations were comparatively more elaborate; the current study is performed with I. Yavetz (TAU).

Anglo-American Bombers over Romania in the Spring and Summer of 1944

Professor Traian Constantin Dumbraveanu

For over 4 months, American and English bombers executed 41 air strikes on Romania, out of which 11 at night (April - 6 day and 1 night, more - 5 day and 3 night attacks, June - 4 daily attacks and 1 night, July - 8 daily and 4 night attacks, August - 7 day and 2 night attacks), most strikes being given to Ploiesti - Campina (30 attacks) , followed by Bucharest (20 attacks), Brasov (7 attacks), Giurgiu, Focsani and Turnu Severin (5 attacks each). With all the material damage to the state departments and the autonomous regies, as well as the destroyed and damaged buildings, the large number of dead and wounded people, the Romanian people had favorable feelings towards the allies. The numerous testimonies we have from the airborne officers and non-commissioned airmen from the camps in Bucharest and Timișul de Jos, near Brașov, prove the particularly good prison conditions and positive feelings that American and English aviators did not expect. International Red Cross delegates confirm this. After the arrest of Marshal Antonescu and the entry of Romania into war together with the allies, heroic gesture of aviator Captain Constantin Cantacuzino who, with the cost of his life, carried Lieutenant Colonel James Gunn to Italy in the fuselage of a Messerschmidt 109 G at the US Air Force headquarters, will begin the operation of repatriating prisoners. In the three missions, 1,660 former prisoners were evacuated before the Soviet troops entered Bucharest, of which 1,135 were Americans, equivalent to 106 heavy bombers. There was no hostility between the Anglo-Americans and the Romanian people, aware that the allied bombings, as well as material destruction and loss of life, were part of the "price of the alliance with Germany."

An Armoured Military Technological Twist

Professor Matitiahu Mayzel

In this paper, I shall trace the development and history of the development of the Merkava Main Battle Tank [MBT], currently used by the IDF [Israel Defense Forces]. The tank, a product of fully Israeli design and production, has two very interesting historical features. First, it was envisioned, conceptualized, designed, and produced by a very young new state lacking any military and industrial tradition. Yet the tank - named Merkava [i.e. chariot] - is one of the technologically most advanced and versatile weapon systems in military operational service in the world.

Second, this weapon system introduced a twist into the conventional pattern of armoured fighting vehicles [AFV] technology. The tank forces of the IDF [Israel Defense Force] started with 2 Cromwell tanks stolen from the withdrawing British forces. Facing great obstacles in acquiring tanks in the world weapons market, the developing Israeli defense industry improved the old obsolete tanks of WWII generation, mainly by replacing the old 76mm gun with a modern one and improving the track-steering-suspension system. As attempts to collaborate with Britain in the development of the Chieftain tank, in the mid-1960s the Israeli defense industry started to develop a new tank based on new concept.

The well-known conventional basic prerequisite of armour [as well as fire power, mobility, and reliability] great emphasis was given to refining the operational environment, and especially the protection of the crew. This was achieved by placing the engine at the front, thus radically revising the architecture and design of the tank. The product - the Merkava - is a MBT on par with the most advanced AFV weapon systems in the world.

With UN Air Support: Challenges, Changes, and Perspectives

Mr. Enrico Magnani

As of today, current deployment of civilian and military air assets to UN peace operations are pivotal for the management of stability operations. Aviation assets, which include fixed-wing aircraft, utility and attack helicopters, and unmanned aerial systems, are key enablers that give peace operations the mobility and agility they need to deter and prevail against hostile actors. They are also force multipliers that enhance the effectiveness of multidimensional operations, allowing them to implement their mandates. However, peace operations face a chronic shortage of air assets with the right capabilities, and pressure to cut costs is likely to push missions to further rationalize and reduce the use of air assets. The proposal would look, shortly, at how missions' air assets are organized, generated, managed, tasked, controlled, and commanded. It also makes a number of recommendations to address persistent shortcomings. Those could be synthesized as: at the headquarters level, the UN should take a more strategic approach to deploying air assets, facilitate multinational rotation contributions, encourage triangular partnerships, share air assets among missions, and review the policy for command and control. Thus, at the mission level,

the UN should require civilian and military components of aviation units to be better integrated, implement existing policies and procedures, provide training on standard operating procedures, and restrict the use of special flights.

S2F Taming Sounds and Transmitting Speech

Location: H 26

Organiser: PC

Chair: Darryl Cressman

From Hal to Her: Cinematic Representations of Synthetic Speech

Ph.D. candidate Benjamin Lindquist

Long before Siri, Alexa, and Google Assistant entered our homes, films imagined the disembodied voice of technology. I mean to use cinematic characterizations of disembodied speech as a starting point to begin to understand the cultural meaning of the voice of the machine. Synthetic speech will allow me to track our changing dystopian and utopian imaginings of the boundary between the human and the machine.

*Filmic representations of machine speech and the real-world technology developed in tandem. In 1962 an IBM 704 serenaded the science fiction author Arthur Clarke with an electronic rendition of “Daisy Bell.” Six years later, this children’s song appeared in Stanley Kubrick and Clarke’s screenplay for *2001: A Space Odyssey*. In HAL’s famous death scene, he experiences an atavistic reversal, singing the song he learned in his “childhood” and paying homage to the origin of the computer voice at Bell Labs.*

*Unlike other films, *2001* “presented the possibility that future computers would speak and function like human beings.” Reflecting on the film, a Bell Labs engineer suggests that HAL’s voice was both a model for researchers and a guide to explain their work to outsiders. “Often, at social gatherings, people asked me what I did at Bell Labs. My standard reply, that I worked on talking computers, generally drew a blank until I referred to HAL in *2001*. HAL provided a better explanation of my work than I could devise myself.”*

Like HAL, most existing robots do not look human, but increasingly, they do sound like us. How did the cinematic representations of machine speech evolve and what do these changing sounds expose? Depictions of synthetic speech reflect our own fears and hopes: presenting us with a mirror in which we can see our values reflected—or, better yet, echoed.

“Blueprint for Modern Living”: Promoting Residential Telephone Service in the United States, 1945-1965

Dr. Jan Hadlaw

This paper examines changing conceptions of the place of telephone technology in the North American home during the period between 1945 and 1965. From the telephone's invention in the 1870s until the years following World War I, the American Telephone & Telegraph Company—AT&T or Bell—directed its advertising at businesses, promoting the telephone almost exclusively as a business tool for the office, shop, and factory. Bell's first advertising campaign directed at the residential market, the "Comfort and Convenience" campaign, appeared in 1927 and focused on the use of the telephone in the homes of the social and business elite. While ostensibly promoting a domestic conception of telephony, its appeal actually replicated Bell's established notions of the telephone's uses. The advertisements depicted the lady of the house performing tasks not dissimilar to those of an office manager—ordering supplies, arranging deliveries, planning and coordinating events—with the assistance of her domestic staff and the telephone.

When, in the mid-1940s, AT&T finally turned its marketing efforts to promoting the telephone's use in the middle-class, servantless home, it had to imagine new ways to represent its idea of the telephone as a management tool, and along with it, new conceptions of its female residential users. Drawing on Bell's mid-20th century telephone advertising and its marketing of extension telephones in mass-circulation and women's magazines, architecture and builder trade journals, and Bell's own telephone directories, my talk traces the relationship between the integration of the telephone into the spaces of the middle-class home and the reimagination of the North American home, homemaker, and family.

S2G Support of Science, Technology and Society Interactions to Innovations

Location: E IIA

Organiser: PC

Chair: Esat Arslan

Science and Technology History Studies in the National Academy of Science of Ukraine

Professor Alla Lytvynko

The Ukrainian Academy of Sciences was founded on November 14, 1918. In the spring of 1928, academician I. Malinovsky proposed to organize a Commission on the history of knowledge at the Academy. The Commission for the History of Natural Sciences was established on February 13, 1934, and existed until 1942. In 1946, a Department for the history of mathematics (headed by Y. Shtokalo) was established at the Institute of Mathematics. In December 1948 academician V. Danilevsky proposed to create the Institute of the History of Engineering to study the history of national engineering and technical sciences, technical education, technical literature, technical terminology. On March 11, 1949 the Department for the history of technology at the Institute of Heat Power Engineering, as well as the Commission for the History of Technology (headed V. Danilevsky) were organized. It was planned to transform the Commission

into the Institute for the History of Technology, but due to lack of funds, the intention was not realized.

On January 4, 1963, on the basis of the Department for the history of mathematics and the Department for the history of technology The Sector for the History of Natural Science and Technology (originally called The Sector for the History of Technology and Natural Science) was organized.

In 1986, based on the Sector and the science divisions of the Council for the Study of the Productive Forces of Ukraine the Center (now Institute) for Scientific and technological potential and science history studies was organized (headed G. Dobrov). In this center the Department of the history of science and technology was established (now called the Department of the history and sociology of science and technology).

Contributions of Romanian Researchers and Applicants in the Evolution of the Complex Forum ICOHTEC

Professor Liviu Alexandru Sofonea

The World Wars I and II essentially marked a new historical era /eon/ of Humanity which also metamorphosed the Culture and Civilization. In this mutational time the Homo Technicus Technologicus had a very complex and important presence and must face to many challenges. In the tense but with some hope years 1970s, the international organization ICOHTEC was founded, as a reaction to the Cold War. Researchers and applicants from Romania react also with appropriate studies, programs, and social achievements in the in history and philosophy of science and technique. In the paper some historical data will be presented. In 1956, the Romanian Committee for the History and Philosophy of Science (CRIFS) was established at the initiative of Academician Traian Savulescu, President of the Romanian Academy.

In November 1972, CRIFS organized his first scientific communication session, and since this year, scientific sessions have been held annually. An important event was the year 1981, when CRIFS organizes in Bucharest the XVI International Congress of the History of Science; In this contextum historicum, it was reorganizes CRIFS which becomes CRIFST - Romanian Committee for the History and Philosophy of Science and Technique, an institution with three divisions. The paper will reveal the contributions of Romanian scientists and applicants to this mutation.

The sources are: proceedings of CRIFST, the revue ICON, proceedings of ICOHTEC symposiums, and other publications included in NOEMA, NOESIS and Studii si cercetări of Romanian Academy. The Romanian contributions are different: in terms of didactic, epistemic, and, as well as, the preservation of technical / tehnological, tehnonomiacal/ heritage; some future actions plans are also summarized. At the 50-th anniversary of ICOHTEC new challenges occur, and the Romanian contributors should answer presents in duty.

Informatics in Romania: Theoretical Developments and Applications

Professor Eufrosina Otlacan

The paper presents some steps of the informatics' history in Romania. At the beginnings, the mathematical basis constituted the research theme for a group, mathematicians and engineers, around Professor Grigore C. Moisil at the faculty of Mathematics of the University of Bucharest. The chapters which were debated regarded especially mathematical logics, algebraic theory of switching circuits, theory of algorithms, computers programming. Further Professor Solomon Marcus developed a school around his studies on mathematical linguistics. In 1970, Moisil wrote, in regards to the development of theoretical basis of computers, that Romania held the third place in the world, after USA and Soviet Union.

All these mathematical studies found applications. The Center of Calculus of the University of Bucharest solved economic problems, like optimization in energy distribution or in those of transport problems, and proposed programs for the researches of the history, archaeology or astronomy. The development of researches emerging from mathematical linguistics continued on a large scale, in the country and abroad, by the theory of algebraic grammar, contextual grammar, membrane theory. Among applications, the automatic translation and the study of the biologic cell are now in attention of the scientists. In order to solve the practical or scientific problems, for which mathematicians and engineers created programs, computers are needed.

The history of computers in Romania knows many steps. The first computers were developed at the Institute of Nuclear Physics IFA from Bucharest, then at the Polytechnic Institute from Timisoara and at the Institute of Calculus from Cluj. A governmental forum was created to assist the computers' development, between 1960 and 1990. Within the collaborations with la Compagnie Internationale pour l-Informatique of France and with IBM from USA, the Romanian enterprise Felix SA produced a series of computers between 1985 and 1990. Applications of Informatics as an internet support are now an important basis for human communications and for the cultural development.

Petre (Pierre) Sergescu, Science Historian and Promoter of the Discipline
Professor Alexandre Herlea

Born in 1893 in Romania, Petre Sergescu, a mathematician and historian of science, played a major international role in the institutional organization of the history of science after the Second World War. Graduated (1916) from the Faculties of mathematics and philosophy of the University of Bucharest as well as from the Conservatory of Music, he continued his studies in Paris. Here he was a student at the Ecole Normale Supérieure where he obtained in 1922 his degree in Mathematics and followed the courses of history of Mathematics of Pierre Boutroux at the Collège de France. Back in Romania, he passed his doctorate with a brilliant thesis and was appointed in 1926 professor of analytical geometry at the University of Cluj where he founded the journal „Mathematica” (Bilingual review: French, Romanian) and organized the first Congress of Romanian mathematicians. In 1943, P. Sergescu was

appointed professor at the Polytechnic School of Bucharest, whose President he became in January 1946. But in August of the same year, he took refuge in France, where he had often stayed in the period between the two World Wars and where he married a writer of Polish origin, Marie Kasterska. Together they hosted a prestigious cultural salon in Paris, in the Quartier Latin, until the end of 1954, the year of his death.

From 1932, P. Sergescu participated in the activity of the group of Sciences historians formed around Aldo Mieli who had created, in 1929, "The International Academy of the History Science (IAHS) where he himself became a member in 1935. He had already published a lot in the field including the book "Gandirea Matematica" (Mathematical thought) crowned by the Romanian Academy and "Mathematical Sciences in France" crowned by the French "Académie des Sciences".

From 1946 on, while being very active in the Romanian emigration in Paris (President of the academic institution "The Royal Foundations University of Charles I" created by the Romanian exiles in 1951), P. Sergescu is the driving force behind international collaboration in the History of Science. It began with the resuscitation of IAHS which had interrupted its activities during the war and of which he was, since 1937, Vice-president; He was elected President in 1947 and Perpetual Secretary in 1950. This institution acts, in parallel with efficiency, for the establishment, within the framework of UNESCO and of The International Council of Scientific Unions (ICSU), institutions created after the Second World War, of The UIHS (International Union of History of Sciences) of which he was elected Secretary-General in 1947, the year of its creation. The same year he became editor-in-chief of the "International History of Science Archives" whose first issue had just appeared and of which he became director in 1951.

However, in Paris, P. Sergescu also developed other activities in the field of science, its history, teaching and dissemination. From 1946 onwards, he organized the annual meetings of the Science history section of „The French Association for the advancement of Science – AFSA”, founded the Mathematic history Seminar at The Institute Henri Poincaré and participated in the setting up of monthly conferences in Discovery Palace He also played an important part in the realization of several exhibitions. His activities and achievements received general recognition; He became a member of several academies and learned societies and received distinctions including the Légion d'Honneur.

SzH Commanded Nature: Technology and the Environment in Authoritarian Regimes

Location: E IIB

Organiser: Viktor Pal

Chair: Slawomir Lotysz

Managing Natures in Interwar Poland: The Case of Pripet Marshes
 Professor Sławomir Lotysz

The aim of this paper is to explore the question of the planned amelioration of the Polesie Marshes – a vast area of swamps embracing some 1.5 million hectares in a context of growing environmental awareness in interwar Poland. Completion of the project would have meant solving a number of urgent social problems such as easing the “hunger for land” from overpopulated areas in the central and western part of Poland, from where the future settlers were supposed to be derived. This would have totally changed the ethnic structure of the entire Eastern Borderlands.

The plan assumed an uncompromising conquest of nature, which together with the desired cultural changes, represented a semi-colonial approach toward the Eastern territories. This approach was held not only by the government representatives involved, but also by Polish society at large. Unsurprisingly then, the discourse was also attended by early environmentalists, who quite rightfully considered the planned drainage as a threat to the unique natural features of an area known to be the largest wetland complex in Europe, and still largely unaffected by human activity. These naturalists called for thorough environmental studies to be made, as well as adoption of a less invasive drainage plan that would prevent land desertification. They also proposed establishment of natural reserves, or parkland, to protect the most valuable areas. The discourse drove on the nature-culture dichotomy, placing those who defended the environment as being against progress, and explicitly calling their attitude “unpatriotic”.

In my paper, I am going to examine to what extent the arguments of conservationists were actually put into practice before the war, and how their efforts influenced the awakening of environmental consciousness in Polish society of the era.

Socialist Landscape Planning: The Construction of Mechanic Forest in Southern Moravia in 1970s

Dr. Jiri Janac

*In 1959 Czechoslovak communist government launched the preparation of *The Complex Water Management and Soil Improvement Scheme for Southern Moravia* (PAVLÍK, HRABAL et al. 1983). The goals of the project were driven by modernist ideas of mastery of nature and framed by economic concerns. The construction took place between 1969 and 1992, and resulted in the vast transformation of landscape. Large water reservoirs cover area of more than 3200 hectares, rectification of water flows changed the hydrological regime of soils in adjacent fields, more than 1200 hectares of unique habitat of floodplain forests disappeared and all this changes brought about significant change of local climate.*

However, during its construction period in 1970s, the project has been partly re-designed as a part of Czechoslovak participation at the UNO Man and the Biosphere

project (MaB) and became heralded as being developed “in harmony with both the long-term plan of the country's national economic development and the principles of ecology, while duly respecting the ecosystems as well as the integrity and conservation of the environment” (VANÍČEK and HRABAL 1974). The wet infrastructure designed to enhance agricultural productivity has thus transformed into “ecologically informed complex landscape transformation” (PENKA 1991) in an attempt to create “hybrid landscape”, coupling its “natural” (ecosystems) qualities with technological objects (ZELLER 2007).

This paper looks at the construction of what might be called hybrid socialist landscape. The main argument focuses on the selective application of environmentalist ideas in the process of harmonization of socialist ideology, economic planning and ideas of global environmental security.