The Tenth Norwegian Conference on the History of Science
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Book of abstracts

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1. Keynotes

Keynote 1: **Bergen museum 1825. Knowledge for a Public Sphere**

Anne Eriksen, University of Oslo

According to the recent definition of the International Council of Museums (ICOM), a museum is "a not-for-profit, permanent institution in the service of society". When Bergen museum opened in 1825, it was likewise defined as an independent, public institution. It was the first collection in Norway not privately owned, nor part of the University. However, the civil society of which this museum was a part was very different from that which museums are supposed to serve in the contemporary world.

This keynote will discuss how the new museum in Bergen conceptualized its relation to the public and its role in the public sphere. The museum identified itself as a scientific institution with educational purposes, but how could science be made public when higher education was still the privilege of the select few? How did Bergen museum present its agenda and aims to the public, and how were the connections between science and civil society articulated and performed?

Keynote 2: **Epochs, trajectories, rhythms: Visions of historical time and scientific knowledge in the 20th century**

Staffan Bergwik, Stockholm University

Since the 1960s, historians and sociologists of science have challenged whiggish narratives, emphasizing science as a situated practice and fostering analyses of the spatiality of knowledge. As a result, the focus shifted to the spaces, geographies, and transits of scientific knowledge, with less attention to its temporal dimensions. Consequently, analyses of temporal processes in the history of science remain underexplored.

Simultaneously, recent scholarship in the humanities characterizes the early 21st century as marked by "temporalization," driven by debates on climate change, the Anthropocene, and threats to democracy. In this context, past, present, and future coexist in contested relationships, prompting a reevaluation of traditional historiographic assumptions. This calls for renewed historical analysis, akin to the rise of postcolonial studies in the 1970s.

How does this process of temporalization impact our understanding of science as practice and culture? I will address this in two parts. First, I analyze a historical case focusing on discourse surrounding "scientometrics" and environmental science in the postwar era. I explore dominant notions of past, present, and future – as well as ideas of historical trajectories and temporal rhythms – in discourse on science, aiming to historicize temporal concepts as they are understood in the 2020s.

Second, I examine how research on historical time can provide tools for reforming temporal thinking in the history of science. Growing insights into multiple temporalities offer valuable perspectives for rethinking the foundational temporal assumptions we hold as historians of science.

2. Prepared sessions

Session A: Meetings between science and policy. Research policy in the post-war period in Norway and Sweden

In the decades after World War Two the policy and politics for research went through substantial changes in Norway and Sweden. A significant shift was the way military defence and security policy became influential in the direction, funding, and organisation in the government's policy for Research and Development (R&D). Another change was the growing emphasis put on scientific knowledge in building the Scandinavian welfare state. One more substantial shift was how research became related and linked to innovation. Beginning in the 1950s and 1960s the fruitful combination of R&D and innovation gained recognition in international organisations such as the Organisation for Economic Cooperation and Development (OECD), in national governments, industries and other societal actors. R&D became a driver for economic development, a trend that accelerated in the so-called post-industrial society from the 1980s, in years when governance of science became vital to secure productive findings and innovation.

In the session we explore central military, economic and societal issues in Norwegian and Swedish research policy after 1945. What differences and similarities do we find when it comes to scientific themes and problems, national research policy and the institutionalisation of R&D-activities?

Organizer:

Vera Schwach, Research Professor

NIFU, Nordic Institute for Studies in Innovation, Research and Education, Oslo, Norway

vera.schwach@nifu.no

Priority and downplay: The role of public research institutes in Norwegian policy for research

Vera Schwach, Kari Tove Elvbakken

NIFU, Nordic Institute for Studies in Innovation, Research and Education

vera.schwach@nifu.no

Department of Government, University of Bergen

karitove.elvbakken@uib.no

Public research organisations (PROs) were a central element in the Norwegian research policy in the decades after 1945. This paper investigates how a manifold of public research institutes built a basis for governmental, applied knowledge production, and compares the development in Norway with the trends in Sweden and Denmark.

The paper argues that the PRO's knowledge production contributed to the growth of substantial research fields in both civil and military sectors, such as the country's physical infrastructure, health issues, management of natural resources, industrial development, and innovation, and not least the making of a welfare state.

The paper points out two substantial shifts in the 1980s which gradually diminished the PRO's role in research policy and in the academic community. First, the government's interest turned more into efforts to improve research performances in the higher education sector. Second, and more critical, a general political shift towards market-based principles took place. For the PRO's, the shift resulted in a turn to extended external funding, more competition for means, and over time to a governance by quantitative measurements – indicators. Public research organisations had to implement judicial and institutional reforms and meet new challenges by adjusting their knowledge production to more of a market driven funding and steering logic. The paper claims that the government indirectly came to downplay the position of many of the public research institutes as a part of the national research policy. But, unlike the Danish government, the Norwegian government did not decide to merge most of the research institutes with the universities. And in Sweden, the public research institutes have, with a few exceptions been an anomaly in research policy at least since the 1980s.

Setting the Stage for Science Policy: The Parliamentary Debate on Research in 1960s Sweden

Per Lundin, Ingemar Pettersson

Per Lundin, Professor of History of Technology

Div. of Science, Technology and Society, Dept. of Technology Management and Economics, Chalmers University of Technology, Gothenburg, Sweden

per.lundin@chalmers.se

Ingemar Petterson, Researcher

FOI Totalförsvarets forskningsinstitut, Stockholm, Sweden

ingemar.pettersson@foi.se

This paper analyses the parliamentary debates on research politics that took place in the Swedish Riksdag during the mid-1960s. Specifically, it focusses on the activities of Swedish Society of Parliamentarians and Scientists (*Sällskapet Riksdagsledamöter och Forskare, RIFO*). In 1965, RIFO submitted a four-party parliamentary motion in both chambers of the Riksdag which argued for the need of a "research politics". RIFO pointed out the lack of transparency in the Government's allocation of funds for research. At this time, approximately 80 percent of the research funding went to military research and atomic energy research, and scientists were hardly involved in the decision-making. RIFO argued for the need of a research statistics (in order to increase the transparency). It also wanted to see a specific Ministry for Research and a Minister of Research.

The subsequent debate in the Riksdag is to our knowledge the first time "research politics" was explicitly discussed in Sweden. Whereas RIFO suggested a broad understanding including heavily funded military technology and atomic energy, the Government argued for a narrower understanding mainly encompassing university research. While RIFO wanted a parliamentary discussion of what kind of research that should be pursued, i.e. a democratic model, the Government wanted the deliberations to be taken within the Chancery (*Kanslihuset*), i.e. a technocratic model. The outcome of the debate, which the Government won with a hair's breadth, was that research politics henceforth came to equal university research politics.

Universities and research institutes in the innovation economy, from 1960s to today

Terje Finstad

Associate Professor, Department of Interdisciplinary Studies of Culture, NTNU, Norwegian University of Science and Technology

terje.finstad@ntnu.no

The relations between universities, research institutes and society have become manifold. Among other things, the mandate of the universities to do research and education has been supplemented with an innovation-oriented mandate. This has created new demands for collaboration with state and industry. In the book *Insatiable Curiosity*, Helga Nowotny claims what science is driven by a curiosity that is unpredictable in its consequences and direction. For Nowotny, innovation is something else than science. Innovation responds to the needs of society and is today central in the taming of science so that it produces «deliverables». In short, where science brings insecurities into society, innovation aims to tame these and make them productive. Innovation then is a form of apparatus or machinery that aims at taming science. This presentation explores attempts to tame science through innovation tools from the 1960s to today. As such it asks how universities and research institutes have answered to, but also shaped innovation policies.

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Session C: Communications and visualizations. The Sciences and the Sàmi in the nineteenth and twentieth century.

The Sami peoples of Northern Scandinavia and Russia have been subjects of scientific or scholarly knowledge since the 18th century. The knowledge has been communicated in books or other formats, also in various forms of visualizations. The indigenous knowledge of the inhabitants of the region has, not surprisingly, been largely ignored, and later, subjected to interpretations by the knowledge producers from their own premises and contexts. In this session we will discuss the knowledge that was produced and communicated by a number of these scholars, from different countries and with different agendas, with special attention to the power dynamics inherent in these epistemic projects.

The session consists of three papers and a final discussion.

Organizer:

Svein Atle Sålevåg

AHKR, University of Bergen

Svein.Skalevag@uib.no

Communicating knowledge on the Skolt Sámi in unstable contexts – Väinö Tanner and the unclarified colonial potencies of Finland

Jukka Nyyssönen

Research professor, Norsk institutt for kulturminneforskning

Jukka.Nyyssoenen@niku.no

Professor Väinö Tanner (1881-1948) was a versatile and multidisciplinary scholar, who is remembered mostly of his work on geology. He also produced human geographical studies on Skolt Sámi and later in his career on Labrador. His scholarly production took place in the beginning of the descend of the empires, during which, however, the colonial discourses still affected the work of the scholars working on indigenes in numerous ways. By examining his texts and oral presentations to various audiences, I study the communication of knowledge by Tanner, with a special focus on the ways he coped with the colonial discourses and the different audiences he disseminated knowledge to. The case is interesting because of the unstable contexts: as a Finland Swede he had problems adhering to the idea of a colonial Finland, in its fullest meaning and potency, but he had to relate to Finnish-speaking audiences beginning to dominate the Finnish institutes of higher education. It is argued that while the idea, hierarchies and practices of colonialism were not an anathema for him, the problem colonialism constituted in the Finnish context destabilized identity politics in his human geographical work and its communication. This does not concern the position of the Skolt Sámi – it was always the lowest, due to the discursive strength of the same discourses.

Scientists/scholars and organic intellectuals on Sámi culture and utilization of land

Astri Andresen

Department of Archaeology, History, Cultural studies and Religion, University of Bergen

astri.andresen@uib.no

From the 18th century there was a steady stream of books written by scientists and scholars of different disciplines about the indigenous people of Norway, Finland and Sweden, their cultures, biology and natural surroundings. Much energy seems to have been spent on this endeavor – why and for what? Should we understand the scientists/scholars as men (normally) in search of new knowledge for the sake of truth and their personal interests, as servants of colonialism, or perhaps something in between? And what happened when, from the late 19th century, a new kind of writer also appeared on the public scene, Sami organic intellectuals (cf. Gramsci), with texts on themselves and their relationships with neighbors and the wider world? Those writers sometimes referred to and commented upon scientific/learned texts by outsiders, and thus confronted, or supported, science "proper". Did scientists/scholars reciprocate? Looking specifically for discourses on culture and the use of natural resources from the late 19th until the mid-20th century, this paper will give an impression of how scientists and organic intellectuals conceived each other's knowledge.

Prince Roland Bonaparte and the anthropology of the Sàmi, 1884

Svein Atle Skålevåg

Department of Archaeology, History, Cultural studies and Religion, University of Bergen

Svein.skalevag@uib.no

In 1884, Roland Bonaparte led a small French scientific expedition to Finnmark, with the primary aim of studying the Sámi people living there. The methods employed by the expedition members included photography, craniometry, and ethnography. The plan was reportedly to produce a major work on Sámi anthropology, but this work was never realized. The most significant outcome of the expedition was a large number of photographs, mainly portraits of people in Troms and Finnmark. These portraits are among the more well-known anthropological photographs taken by travelers in northern Norway and Sweden toward the end of the 19th century, and digitized versions of them are now readily available in various digital collections. However, the scientific project from which they originated has been little studied. In this presentation, I will outline Bonaparte's journey and discuss his knowledge production, with particular emphasis on epistemological questions related to anthropological photography in the 1880s.

The presentation draws on perspectives from historical epistemology (Lorraine Daston, among others), as well as published and unpublished material from Bonaparte's expedition. It also builds on a study of Paolo Mantegazza's anthropological photographs, also from the 1880s (Skålevåg, S.A. «Samer som kunnskapsobjekt. Paolo Mantegazzas skandinaviske reise i 1879).

2. Individual abstracts

Constructing a liberal democracy: Western science communication in the Cold War context

Ahto Apajalahti

MA, PhD student

University of Helsinki

ahto.apajalahti@helsinki.fi

The role of science in the Cold War public sphere is often associated with promoting economic development through technology-driven applications. However, it has also been demonstrated that the idea of science as peaceful international cooperation had particular resonance in public discourse.

As part of my ongoing PhD research on popularisation of science in Finland during the Cold War, I've examined the motivations of scientists, particularly physicists, whose works were either published in Finnish or translated into Finnish between the 1940s and 1960s. What emerges from this popular science literature, as well as from articles by scientists in newspapers and magazines, is an attempt to promote attitudes and mindsets suitable for an average citizen in a liberal democracy.

Anticommunist Western scientists argued that increased public understanding of science would encourage reason, rationality and moderation. These qualities could serve as antidotes to populist and extremist ideologies. Rather than directly attacking communist or socialist ideologies, many scientists sought to create a positive narrative around the values of Western liberal democracy.

In contrast to responses that promoted laissez-faire capitalism, chauvinist nationalism, or other bellicose values, these scientists advanced the scientific mindset as a model of citizenship in a liberal democracy.

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A Path Between Continuity and Innovation: Communicating Electrical Science through the Instrument Collection of the Politecnico di Torino

Margherita Bongiovanni, Emma Angelini

Politecnico di Torino, Ufficio Gestione del Patrimonio Storico dell'Ateneo (ARIA), Torino, Italy

margherita.bongiovanni@polito.it

Politecnico di Torino, Dipartimento di Scienza Applicata e Tecnologia, Torino, Italy

emma.angelini@polito.it

This contribution explores how historical scientific instruments function not only as tools of research and education, but also as powerful media of communication, embodying and transmitting knowledge, practices, and values across generations. The instrument collection of the Laboratory of Physics at the Politecnico di Torino, preserved today in the Department of Applied Science and Technology, offers a unique lens into the communication of electrical science in Italy between the 1920s and 1960s.

Originating from the Physics Department and the Superior School of Electronics, founded by Galileo Ferraris in 1888, this collection includes voltmeters, electrometers, galvanometers, and other devices used for teaching and research. These artefacts reflect the technical evolution of electrical metrology, as well as the institutional and cultural processes that shaped how electrical science was taught, shared, and understood.

By studying and displaying these artefacts, we do more than preserve physical objects—we engage in a form of science communication that recovers lost practices, reinterprets legacy, and invites new audiences to question how science was, and still is, made visible.

Summarizing this study is part of a broader project involving the recataloguing and valorization of the historical collection to be displayed on the Politecnico di Torino's web museum portal. This work serves as a foundation for the narration of science, with a view toward the development of a science museum at the Politecnico di Torino.

The project contributes, as one of the university's Third Mission activities, to broader discussions on the ethics, methods, and politics of communicating science through collections.

Tank Work. The Trondheim Ship Model Tank and the International Circulation of Ship Modelling Knowledge ca. 1930s-1960s

Thomas Brandt

NTNU

Thomas.brandt@ntnu.no

This paper concerns the activities of the Norwegian Ship Model Towing Tank ("Skipsmodelltanken") in Trondheim, Norway. The towing tank in Trondheim opened in 1939, after years of planning and fundraising. Naval architects had been using model towing in open basins since the early 18th century, and by the start of the 20th century, modern tanks were established that could simulate the behavior of ship models at sea in a laboratory setting.

Based on archival records and published proceedings, the paper explores to what extent the Trondheim Ship Model Towing Tank was aligned with the discussions taking place at the International Towing Tank Conferences (ITTC) from the mid-1930s throughout the 1950s and 60s. The towing tanks congregated communities of practice that encompassed university professors, engineers, naval architects, and military officers, discussing hydrodynamics, ship propulsion, and construction standards. By investigating this conference as an arena of knowledge circulation the paper intends to contribute to the scholarship on international scientific conferences by considering, amongst other issues, to what extent the ITTC fits into the typology of scientific conferences as suggested by Bigg et al. (Bigg, Charlotte, Jessica Reinisch, Geert Somsen, and Sven Widmalm. 'The Art of Gathering: Histories of International Scientific Conferences'. *The British Journal for the History of Science* 56, no. 4 (December 2023): 423–33. https://doi.org/10.1017/S0007087423000638.)

Privileges, Print, and Power: Governing Scientific Communication in Early Modern Europe

Marius Buning

University of Oslo
marius.buning@iakh.uio.no

Between the sixteenth and eighteenth centuries, European governments and institutions used printing privileges as a mechanism to control the production and circulation of printed texts and images. These exclusive rights were more than tools of censorship or economic protection; they were fundamental to the development of early frameworks of intellectual property and crucial to how knowledge was distributed, structuring how texts and images were circulated, how authority was claimed, and how boundaries of expertise were drawn. As such, printing privileges played a formative role in shaping early modern regimes of scholarly communication.

Although landmark cases - such as privileges granted to figures like Descartes or Tycho Brahe - have received scholarly attention, they are usually studied in isolation. This paper takes a broader, comparative approach, using systematic data from the ERC-funded *Before Copyright* project. By analysing the distribution of privileges across regions and disciplines - particularly in legal, medical, and natural philosophical works - it identifies patterns that reveal how different political and institutional contexts shaped the communication of scientific knowledge in early modern Europe.

Science under the Red Star: Posters as Propaganda and Mass Communication Tools in the Soviet Empire

Prof. Tsira Chikvaidze

Head, Department of History, School of Arts and Humanities, University of Georgia

ts.chikvaidze@ug.edu.ge

Posters — including those about science — in the Soviet Union functioned as instruments of power, simultaneously serving as tools of propaganda and mass communication. For the Soviet regime, science was not only a symbol of progress, but also a powerful mechanism of ideological control. Posters, as a visual medium, were widely used to shape public consciousness and popularize scientific achievements, while also reinforcing state-sanctioned ideological narratives.

The aim of this paper is to analyze how science-themed posters were utilized in Soviet mass culture to mobilize the public, visually depict technological advancement, and strengthen communist ideology. Special attention is paid to how the image of the scientist was romanticized, how technological achievements were portrayed, and how these visual representations supported the overarching idea of building a socialist state. Scientists depicted in these posters were often portrayed as heroes—diligent engineers or innovators - building a better future for the socialist society. The scientist holds a place alongside the worker and the peasant — a symbolic unity of three: the worker, the peasant, and the scientist. These images reflected the state's vision of creating the "new Soviet person", embodying science, technological optimism, and ideological loyalty.

Posters on the theme of science, like all art in the 20th century Soviet Union, were based on socialist realism. Slogans, as examples, from two posters: "The union of science and labor is the key to new victories of Communism" (1968); "Communism and science are inseparable" (1957).

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The Museum as an Epistemic Arena: Scientific Authority and Knowledge Production of Lepenski Vir

Natalija Ćosić, PhD

Lead Specialist for Conservation and Development, Shared Conservation Department, MUHO and Leader of Research group in MUHO

natalija.cosic@muho.no

Arthur Lovejoy (1940) characterised ideas as inherently mobile—often originating within one intellectual domain but readily migrating into others. I argue that museum exhibitions should not be viewed merely as educational platforms for the public, but as active epistemic arenas where professional authority is asserted, contested, and transformed through communicative acts deeply embedded in cultural and political contexts.

In this paper, I explore how scientific ideas about the past become articulated as epistemic entities by tracing the trajectory of archaeological finds from excavation to exhibition. Drawing on Bourdieu's Field Theory, the paper investigates the circulation of ideas across disciplinary boundaries, culminating in museums and exhibitions as sites where scientific knowledge is not only negotiated and stabilised, but also actively utilised and recontextualised.

Using the case study of Lepenski Vir, a Mesolithic site in the Danube Gorge in Serbia, I examine how Dragoslav Srejović's interpretations and exhibition strategies from the 1960s and 1970s went beyond the mere communication of archaeological findings. His work laid the groundwork for a later narrative of cultural continuity, articulated through the lens of *Balkanism* discourse. The monumental sculptures, as named by Srejović, came to function as epistemic markers signalling the beginning of some specific historical time.

Supported by the institutional framework of the National Museum's exhibition regime and legitimised through Srejović's academic and public authority, this created narrative became the implicit perspective of Lepenski Vir within post–World War II Yugoslavia, persisting into the late 20th century.

Medical authority and the racial anatomy of skin: the case of Abraham Bäck (1713-95)

Dr. Vincent Roy-Di Piazza

Postdoctoral researcher, Department of History and Ethnology, University of Jyväskylä (JYU), Finland

Project: ERC Consolidator 'DEPE: De-centring 18th century political economy: rethinking growth, wealth, and welfare in the Swedish Empire' (ERC, DEPE, 101088549)

vincent.sg.roydipiazza@jyu.fi

Historians of science have long been looking at how the production of scientific knowledge intersects with communication practices and social construction of authority. This paper explores these themes through the case of the Swedish court physician Abraham Bäck (1713-95), best known as Linnaeus' best friend and for his work as a medical reformer. During his early training as an anatomist in Europe, Bäck became interested in the debate over the origins of dark skin colour. This led him to dissect and conduct experiments on the cadaver of an unidentified African man in Paris in 1744, and to eventually publish his findings in the *Transactions of the Swedish Royal Academy of Sciences* in 1748. Bäck communicated his skin research effectively to members of the Academy, notably by showing skin samples used in his experiments, and by demonstrating his knowledge of the international scientific literature on race. In this talk, I argue that Bäck's success in presenting his work helped him establish his reputation as an empirical anatomist in Sweden, while tapping into the period's broader fascination for neo-humoralism, human differences, and the emerging medicalization of race.

Science Stories: Contemporary Nobel Prize-Winning Research as a Gateway to Understanding the Nature of Science

Unni Eikeseth

Associate professor, Department of Teacher Education, Faculty of Social and Educational Sciences, NTNU

unni.eikeseth@ntnu.no

In the years 2004-2005, the grid cells were discovered in a lab in Trondheim, Norway. The grid cells are brain cells that enable humans and other mammals to navigate, through laying out a hexagonal grid as the animal moves around. The discoveries of the grid cells as well as other cells related to the brains' GPS, earned the Mosers' the Nobel Prize in Medicine or Physiology in 2014. The non-fiction book *Finding Places* (Eikeseth, 2020) tells the story of the groundbreaking findings in the Moser lab. The book is based on interviews with May-Britt Moser, Edvard Moser and many other researchers involved in the work, providing insight into the scientific process, the culture of collaboration, and the difficulties the researchers experienced.

Contemporary cases have been found to address many of the traditional dimensions of Nature of science (NOS), such as the tentative nature of scientific knowledge, as well as competition between research groups or the pressure of funding (Allchin, Møller Andersen & Nielsen, 2014). Contemporary cases have therefore been acknowledged as equally important to contextualize student's learning of NOS as historical cases and student-based investigations (Allchin et al., 2014; Allchin, 2017).

In this paper, an extract from the book *Finding Places* will be analyzed using the Whole Science framework for Nature of Science (Allchin, 2017), identifying examples of experimental, conceptual and sociocultural dimensions of NOS. The paper also discusses how the book can be used in explicit and reflective teaching of NOS.

Literature:

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Irrigation from Down Under: Science and policy debates on the viability of irrigation in Australia's Great Artesian Basin, 1884-1945

Sarah R. Hamilton

University of Bergen

sarah.hamilton@uib.no

Across the arid and semiarid interiors of New South Wales and Queensland, the discovery of a vast store of artesian water deep below the surface in the late 19th century promised a brighter, greener future. Deep bores drilled into the Great Artesian Basin proliferated across pastoral lands, bringing to the surface sparkling fountains of heated, mineralized water that flowed across the sands to relieve thirsty sheep and cattle. While pastoralism was the heart of the colonial economy, however, in the years surrounding Federation some saw irrigation with bore water as a potential tool in the state's ongoing efforts to resume vast pastoral leaseholds and resettle them with small independent farms. But such an undertaking relied on shaky scientific foundations: natural scientists of the time expressed serious concerns about the volume of the basin and its ability to support irrigation, and the strongly alkaline character of the water itself destroyed soil fertility within just a few years. For years, as evidence of bore irrigation's impracticality mounted, a small cadre of agricultural chemists and irrigation boosters insisted upon its viability and undertook a series of unlikely field experiments attempting to prove it. This paper will document their failed efforts, which simultaneously reflected both an enduring faith in the ability of science to solve any problem and the rejection of inconvenient scientific truths.

Applied seaweed science and the media: Seaweeds communicated as 'treasures of the sea' since the 19th century

Mentz Indergaard

Trondheim

mentzi67@gmail.com

In the pre-industrial Western world, seaweeds were used as fodder supplement, fertilizer and in a few instances as vegetables. Industrial utilization started in the 17th century with the burning of brown seaweeds for ashes used in the production of soap and glass, replaced in the 19th century by the extraction of iodine. The discovery of vitamins and trace elements in the early 20th century gave momentum to a seaweed meal industry. Modern science has advanced the industrial use of seaweed polysaccharides to thicken and stabilize solutions, and to form films and gels.

My main observation is that the public have little knowledge of this plant resource. Seaweeds are mostly hidden beneath the surface of the sea and have peculiar life cycles, making them mysterious and fascinating to both the public and science journalists. Images of underwater marine plant life first appeared in the 1950s, with SCUBA-diving, UW-cameras and colour film. A second observation is that the mass media have repeatedly credited the use of seaweeds as the solution to several issues. Since the 1950s seaweeds have successively been promoted with *e.g.* «pure environment», «health food», and «bioenergy». The recent Western cultivation of seaweeds has renewed this interest. Seaweed scientists must balance their own sound scientific ideas with the media's need for attractive headlines. In this respect the minor field of applied seaweed science compares with major fields like cancer research and space exploration.

Carl Peter Thunberg and the circulation of bloodletting knowledge in Europe and Japan (late 18th and early 19th centuries)

Shan Jiang & Ulrike Spring

Department of Archaeology, Conservation and History, University of Oslo

ulrike.spring@iakh.uio.no

Peking Union Medical College, Beijing

zarafachiang@gmail.com

This study focuses on the knowledge exchange regarding the medical practice of bloodletting between Europe and Japan during the late 18th and early 19th centuries, using Carl Peter Thunberg's travel report and relevant works of medicine as our vantage point. Swedish botanist and physician Thunberg, trained under Carl Linnaeus, was one of the very few Europeans who were permitted into isolationist Japan in the 18th century. Inspired by Actor-Network Theory (ANT), we view Thunberg's descriptions of bloodletting practices as a node in a global knowledge flow network, set within the context of bloodletting knowledge circulating across time and space.

In Thunberg's reports, there are descriptions of Japanese doctors performing bloodletting treatments and records of his interactions with them. Interestingly, at that time, Japanese society was simultaneously practicing both the mild pricking and bloodletting technique derived from premodern Chinese medicine and the bloodletting methods transmitted from the West. How does this fusion or dislocation of knowledge manifest in his records? When did the shift in knowledge occur? How was it communicated in Europe? This study explores the different translations of Thunberg's works, focusing on the descriptions of bloodletting, to reveal how knowledge of bloodletting was transformed during the translation process.

Moreover, our study extends beyond textual analysis to include the material dimension of knowledge circulation. As a means of supporting knowledge transmission, Thunberg presented his bloodletting instruments to his Japanese students. Arguing that material culture needs to be seen in tandem with textual descriptions to understand the process of knowledge communication, this study will also examine the circulation of bloodletting-related artifacts in Japan.

How pan-European scientific communication contributed to the fight against the re-emergence of leprosy in the Baltic States in the 19th century

Prof. Dr. Andreas Jüttemann

Medizinische Hochschule Brandenburg, Institut für Anatomie, Neuruppin

andreas.juettemann@mhb-fontane.de

Why did leprosy return to the Baltic States at the end of the 19th century, and how did the beginning of international scientific communication from 1897 onwards influence the way the disease was dealt with? While leprosy had largely disappeared in Europe since the Middle Ages, the Baltic states - along with Norway - were the last endemic regions in Europe. The causes of this resurgence were the subject of controversial debate among Baltic epidemiologists, particularly in light of the discovery of the pathogen by the Norwegian physician Gerhard Armauer Hansen (1841-1912).

The fight against the disease in the Baltic States, which belonged to the Russian Empire, was largely in the hands of the German-Baltic elites, who financed research, control measures and treatment. The University of Dorpat (now Tartu), at the time a German-speaking institution with Swedish roots, played a central role in this. The scientific exchange between German, Baltic and Norwegian doctors was intensified by international congresses, in particular the leprosy conferences in Berlin (1897) and Bergen (1909). The German focus on leprosy intensified when the disease spread from the Baltic states to East Prussia.

The planned lecture examines how communication via medical networks, specialist journals and conferences shaped leprosy policy in the Baltic states. In particular, the adoption of Norwegian control models led to the establishment of leprosaria, where patients were often isolated for life.

Newly discovered Estonian archive sources from the year 2024 make it possible for the first time to take a look at the individual course of the disease. This case study contributes to research on the pan-European circulation of medical knowledge and its impact on public communication.

Making Food Modern. Food Chemistry and the Project of Synthetic Food in Eastern Europe during the Cold War

Elena Kochetkova

University of Bergen

elena.kochetkova@uib.no

This presentation explores how chemists in Eastern Europe justified and experimented with so-called synthetic food—edible substances produced in laboratories from non-edible materials, such as oil. Focusing on Estonia, Russia, and Moldova as parts of the Soviet Union during the Cold War, I examine how scientific ideas and experiments circulated within both scientific and political domains.

Driven by Cold War rivalry and a political emphasis on modern consumption, food chemists played a threefold role in shaping what I described as food modernity. First, I analyze how food science contributed to the industrialization of food systems and how chemists consistently pursued sustainable food solutions in response to resource scarcity and the emerging challenges of the Anthropocene. Second, I investigate how belief in technological potential inspired scientific attempts to produce food independent of traditional agriculture. Finally, I examine how these ideas were communicated within the Eastern Bloc and instrumentalized as political tools in the ideological competition with the West even though many of these ideas circulated among Western scientists.

The paper will argue that chemical food experiments reflected a strong belief in modern science as a powerful tool for feeding populations and addressing environmental crises—independently of natural processes.

Historicizing intelligence: tests, metrics and the shaping of contemporary society

Jon Røyne Kyllingstad

Associate professor, Museum for universitets- og vitenskapshistorie/Kulturhistorisk museum, Universitetet i Oslo

jonrk@khm.uio.no

The research project Historicizing intelligence has been ongoing since 2022 and is now about to be finalized. I am the leader of this project, and in my talk, I will present some of our main findings and reflect upon how we communicate and disseminate our research findings.

The project studies the historical development of intelligence tests, IQ-scales and concepts of intelligence, how IQ-testing has acquired its various roles and functions in today's Norway, with a particular focus on the education system. It also addresses the values and relations of authority and legitimacy into which intelligence measurements are woven. The project includes extensive dissemination activities such as a website and an exhibition in three different versions, one aimed at students and employees at UiO, one aimed at a general audience in the Historical Museum in Oslo and one aimed at students at the Faculty of Educational Science (UiO). We will also write a popular scientific book aimed at the general Norwegian reader.

The project aims to historicize concepts, technologies and practices that are used to assess or diagnose individuals and that may have significant impact on their lives. Our communication is directed towards both the experts who use the test, those who are tested, and the general public. This poses some interesting challenges and questions.

Between Numbers and Life Paths: The Practice of IQ testing in School Transfers in Oslo, 1930s–50s

Ageliki Lefkaditou

ageliki.lefkaditou@medisin.uio.no

Intelligence testing of school children, aimed at differentiating students considered of "normal" mental development from those deemed "slow," "abnormal," or "difficult," had been practiced in Norway since the early 1910s. By the 1930s, it became an institutionalized – albeit always somewhat unregulated and evolving – practice, not least through the work of Oslo school psychiatrist Augusta Rasmussen. This reflected broader international trends.

My previous research has shown that although IQ test results were significant, they were not the sole basis for decisions to transfer children from ordinary schools to special education institutions. Factors such as school capacity, bureaucratic procedures, professional disagreements, financial constraints, and the family's social status could play just as large a role as the test results themselves.

This paper sheds light on these complex decision-making processes by examining Rasmussen's practical work, based on an extensive and previously unused archive of transfer reports. From the mid-1930s and for more than two decades, she assessed hundreds of school children using intelligence testing. Her recommendations, alongside evaluations from school doctors and teachers, were decisive for the children's futures. Even though IQ was far from the only criterion, it often carried the most weight in cases of professional disagreement.

As this paper is intended to be developed both into an academic article and a chapter in a popular science book, I will conclude the presentation by reflecting on these dual aims – particularly in relation to questions of research ethics and access to archives.

Communicating Scientific Memory: Museums, Objects, and Cultural Heritage in Modern Italy

Paola Bernadette Di Lieto

PhD Student, University of Padua and Ca' Foscari University of Venice

paolabernadette.dilieto@phd.unipd.it

In Italy, the recognition of scientific and technological artifacts as part of the national cultural heritage has been a slow and uneven process, shaped by shifting political agendas, and changing definitions of cultural value. From the late 19th century to the early 2000s, scientific instruments once regarded as obsolete or purely functional were reimagined as carriers of scientific memory and identity. This contribution traces that transformation by examining how the material legacy of science was reinterpreted, preserved, and presented to broader publics. Drawing on archival research, museum practices, and legislative developments – including the delayed integration of scientific collections into Italy's cultural heritage laws in the early 21st century – it highlights the roles of museums, scholars, and policymakers in shaping public narratives around science and its material culture. By focusing on the communicative strategies employed in exhibitions and public discourse, this study argues that the Italian case offers valuable insight into how science is historicized, narrated, and mobilized within broader processes of nation-building, identity formation, and the politics of memory.

The curator is the problem

Phil Loring

Curator of the history of medicine

Norsk Teknisk Museum / Nasjonalt Medisinsk Museum

phil.loring@tekniskmuseum.no

Over the past several decades, first in art museum contexts and more recently in museums of science and technology, the figure of the curator has become a research field in its own right. There are monographs, edited volumes, and even entire journals devoted to curatorship. In his 2019 paper "Exhibitions as research, curator as distraction," anthropology curator Peter Bjerregaard – then project leader at the University of Oslo's Museum of Cultural History, now director at Denmark's Museum of Science and Technology – argued that the curator's function is to distract academic researchers from their regular disciplinary perspectives in order to cultivate novel cross-fertilizations.

Here, I am going to propose that the curator can and should be distracting in another sense, and particularly so when it comes to curators working in museums of science and technology. Put simply, the curator gets in the way, repeatedly. He, she, or they congest the smooth flow of the museum machine. They complicate the process by which, according to the project management handbook, an exhibition project develops from idea to concept to planning to production to operation. And unless everyone involved in the process, from museum management on down, expects and understands that curators will get in the way, the very real risk is that they will be treated as problematic components to be fixed, rather than promoters of necessary friction.

This paper is my attempt to think through a dynamic that has been bothering me for many years in my roles as a curator in large and medium-sized museums of science and technology: where in an exhibition project does the curator fit?

"I'm 4.7% Ethnic". Natural Science in Memory Cultures

Kristin Mikalsen

PhD student, Karlstad University

kristin.mikalsen@kau.se

Seventy-five years ago, only a handful of scientific researchers were familiar with the concept of DNA. Since then, it has become widely known, particularly through its use in forensic investigations and paternity testing—contexts in which DNA provides answers with a high degree of certainty. In recent decades, commercial companies have begun offering relatively inexpensive DNA tests that claim to provide insights into health, genealogy, and ethnicity. However, in areas such as ethnicity—unlike forensics or paternity—the results are often far less reliable and can even be misleading. Despite this, DNA testing has had a significant impact on many memory cultures.

This is especially true for the Forest Finnish community. Since 2009, an amateur-led project has focused on Forest Finnish DNA, and references to genetic links to Forest Finnish ancestry have become increasingly common. For example, a frequently cited argument in support of building a new Forest Finnish museum in Norway was the claim that as many as "half a million Norwegians" may carry Forest Finnish DNA.

This phenomenon raises questions on multiple levels. As part of an ongoing PhD project on Forest Finnish memory culture, this paper explores how DNA testing introduces a sense of scientific certainty and objectivity into the otherwise fluid and interpretive domains of ethnicity and memory. The focus is not only on the communication of science, but also on what the science itself communicates—and how it contributes to knowledge production within memory cultures.

Using history of science in teaching science communication

Dr Harriet Palfreyman, Dr Elizabeth Toon

Centre for the History of Science, Technology and Medicine, University of Manchester

harriet.palfreyman@manchester.ac.uk

elizabeth.toon@manchester.ac.uk

Science communication as a practice and an academic field is closely related to STS, media studies, communication science, and of course history of science. In the UK and elsewhere, several university science undergraduate programmes now include practical teaching in science communication or even specialised postgraduate programmes in the subject. We lead one such postgraduate programme at the University of Manchester and draw on our academic backgrounds as historians of science and medicine to do so. As such, we teach future science communication practitioners how the history of science has shaped current public relationships with science. We find this contextualised knowledge is vital for creating practitioners who are responsibly and critically engaged with contemporary science.

This paper discusses our module introducing science communication students to major themes in the history of science, technology and medicine, ranging from histories of environmental crises to the historical legacies of eugenics and race science. We do so in part by exploring and critiquing how historians, journalists, science communicators, scientists, policymakers, and activists have used various mass media to talk about the history of science. However, most of our students have never studied HSTM before. What do our nascent science communicators take from the histories of science we explore with them? Our paper seeks to answer just this question, offering a reflection on the value of the history of science to science communicators in the present. Not quite a history of science *as* communication then, but history of science *for* communication.

The Military Advantages of Unclassified Research in 1950s Arctic North America

Peder Roberts

IFIKK, University of Oslo

peder.roberts@ifikk.uio.no

This paper takes up a two-part historiographic question: how could an institution that forswore classified research become valuable to the US military during the height of Cold War Arctic research; and how can historians be confident in their judgments on the question? My case study is the Arctic Institute of North America (AINA), a binational institution formed in 1945 to advance the "orderly development" of the North American Arctic through science. AINA's statutes prohibited it from engaging in classified research, but it nevertheless became dependent on funding from the Office of Naval Research (ONR). Much of that funding was for basic research that had no obvious need for classification but which used facilities such as the Arctic Research Laboratory at Point Barrow, Alaska, which also served as hubs for classified work sponsored directly by the military. Later in the decade the ONR pressed AINA to find research programs for its floating ice islands, which also hosted classified research. AINA's leadership debated whether it should accept classified research contracts (eventually deciding not to) and instead remained a facilitator of open research. But in rustling up projects that conveyed a sense of activity at facilities that also hosted classified work, did AINA serve another purpose in helping to avoid questions about what the sites in question were used for?

Per arricchir di nuovi arcani il Mondo. Astronomy and didactic poetry in 18th-century Italy

Lorenzo De Piccoli

Università di Pisa; Università degli Studi di Firenze

lorenzo.depiccoli@phd.unipi.it

For much of modern European history, poetry was an important avenue for the diffusion and the discussion of scientific ideas, both among scientists and the general public. Many astronomers announced their discoveries to their colleagues through Latin poems attached to their letters, and while 18th-century Italian didactic poetry is mostly associated with agricultural sciences, the connection between astronomy and poetry was maintained. Astronomy was communicated to the public in order to describe the newly emerged Newtonian idea of the universe, characterised by homogeneity, mechanism and an indefinite extension in space and time. Additionally, poetry was used to celebrate and glorify professional astronomers, especially after the founding of the first modern Italian observatories in the latter half of the 18th-century. Finally, the astronomical sciences were endowed with a moral dimension, and described as a way to uplift and reform human morality; in certain cases, Italian authors were inspired by the contemporary debate and speculation concerning the "plurality of worlds" question to imagine extraterrestrial societies, using them to satirize and criticize their own society. Astronomy, refracted through the lens of poetry, can therefore be assessed as a multifaceted topic, which affected many different aspects of 18th-century intellectual history. With my contribution, I would like to offer an overview of the ways in which poetry was used to express, divulge and debate astronomical ideas in 18th-century Italy by discussing a selection of relevant examples, which have been hitherto largely overlooked by critical scholarship, in their historical context.

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Correspondence as Informal Education: Adult Distance Learners, Scientists, and their Pedagogies, 1930-1950

Karen A. Rader

Virginia Commonwealth University

karader@vcu.edu

Correspondence courses are recognized by historians of education as among the earliest forms of distance learning - and they are often described as predecessors of contemporary online learning. But such a perspective elides the role of correspondence-based informal learning experiences and pedagogies, which multiplied in the US during the interwar era, when efforts to grow adult science and technical education multiplied and proliferated.

This paper will present case studies of such correspondences, among them some in-depth study (or combination) of:

1) Letter-writing between prominent public scientists (like Linus Pauling (Chemistry) and Harry Overstreet (Psychology)) and informal learners seeking their scientific knowledge advice; 2) Letter-writing between women science journalists of the Science Service and their readers regarding the medical, scientific, and/or technical content of articles.

Taking these correspondences seriously as sites of scientific and technological education, and taking their non-scientist public participants seriously as idiosyncratic framers of scientific knowledge problems, broadens the history of post-War science education (beyond existing work on K-12 and college classrooms and beyond pipeline narratives). Not privileging expert content delivery mechanisms over learner-driven pedagogies stands to expand both our historical understanding of science and technical learning in the everyday world of the mid-20th-century US, and the yardstick of historical change against which contemporary informal distance learning is measured.

Tracing the Origins of the Norwegian Mining Museum in Kongsberg

Hege Roll-Hansen

Associate professor, Department of Culture, Religion and Social Studies, University of South-Eastern Norway

hege.roll-hansen@usn.no

The Norwegian Mining Museum (Norsk Bergverksmuseum) in Kongsberg opened to the public in August 1945, but its roots trace back to a royal decree in 1841, establishing a collection of both minerals and books, to be located at the Kongsberg Silver Mines. Since the mid-17th century, these mines had been among Norway's most significant industrial enterprises, and cause of wealth and hard labor, evolving technical and scientific knowledge, and an international urban community. The unique mineral collection remains central to the museum's exhibitions, and the assemblage of mineralogical and mining literature points to the town's longstanding education of mining engineers. The museum's origins intertwine multiple temporal layers and knowledge traditions, making it a compelling subject of study. The narrated stories of the mining museum result from the close relationship between state power, geology and prosperity, hence mirroring the contemporary interest in geology and mining, fueled by the planned mining projects in the region, and their manifold challenges. The dependency of our modern life forms on mineralogical resources and the critical consequences thereof, are pressing issues in regional, national, and global contexts.

The paper focuses on the museum's founding history in the mid-20th century. The initiative was spearheaded by mining foreman Bjarne Sannes, with support from the company and the local community. This context impacted the museum as a producer and communicator of knowledge, concerning technological and industrial history, geology, and mineralogy, as well as about the living cultural traditions and daily life of the mining community.

Formalizing Informal Communication: The Origins of the Preprints Exchange System in High-Energy Physics in the 1960s

Dr. Phillip H. Roth

RWTH Aachen University

Käte Hamburger Kolleg: Cultures of Research

phillip.roth@khk.rwth-aachen.de

My contribution looks at the beginnings of the global communication infrastructure that evolved around "preprints" in high-energy physics (HEP) in the 1960s. Preprints rapidly inform members of the physics community about the newest developments and findings in the field, today through pre-publication platforms like arXiv.org. Until the 1940s, however, personal contacts were essential to keep afloat of rapid developments in HEP. Later, the sharing of lecture notes, unpublished reports, or copies of paper manuscripts through the mail or at annual gatherings gained considerable importance to compensate for the global dispersion of the community. Starting in the early 1960s, libraries at leading research centers began formalizing the originally informal practices of preprint communication by establishing bibliographic systems and logistical infrastructures to document, gather, and distribute the global preprints output.

Building on my ongoing research into the media history of preprints, I want to sketch the early development of the preprints exchange system and its paper- and computer-based infrastructures for scholarly communication in HEP. My contribution focuses on developments at the libraries at CERN, which created the first paper-based catalog for preprints to connect local readers to the global preprints discourse; at DESY in Hamburg, which published the "HEP Index," a bi-weekly bibliography of newest preprint releases, including an innovative keyword glossary for searching the preprint-literature; and SLAC, which created SPIRES, a database remotely accessible through an early computer networks, and which published a newsletter to regularly announce the newest entries and track submissions that had been published as formal journal articles.

Testicular juice

Lise Camilla Ruud

Professor, Department of Culture, Religion and Social Studies (IKRS), University of South-Eastern Norway
Lise.Camilla.Ruud@usn.no

In 1893, readers of the Norwegian magazine *Naturen* could read about the experiments performed by the French-American professor Brown-Séquard with "testicular juice." The experiments, which took place in Paris towards the end of the 1880s, involved subcutaneous injections of animal testicular juice into aging men. The professor had used both himself and patients in the trials. The article in *Naturen* was authored by Armauer Hansen, who wrote enthusiastically about the positive effects of the juice. Older men, who had previously struggled with various types of physical decline, became remarkably spry and strong from the treatment.

In hindsight, these experiments are seen as part of the development of endocrinology and organotherapy. At the time, however, these specializations were not established, and the experiments were met with both enthusiasm and ridicule in European scientific and intellectual milieus. In my presentation, I will take as a starting point Armauer Hansen's translation of Brown-Séquard's descriptions and hypotheses, published in The Lancet in 1889. How were these adapted to the popular science format, for a Norwegian readership? The readers were, among other things, informed that man's testicular juice was the source of masculine intellectual and physical strength. They could also learn that one should ensure that sufficient juice remained inside the body and that it should not be lost through "misuse" and "self-contamination." As men aged, their testicles produced less juice, but now juice could be sourced from animals. What the Norwegian readers were not informed about, but which Brown-Séquard detailed in *The Lancet*, was how one could quite easily produce testicular juice from animals oneself.

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Spreading Skills and Sprouting Opportunities: Active Knowledge Exchange via Botanical Museums and Gardens in Nineteenth Century Norway

Solveig Marie Siem

Department of Culture, Religion, Asian and Middle Eastern Studies, University of Oslo

s.m.siem@ikos.uio.no

In the mid-to-late nineteenth century, the Botanical Museum and Gardens in Christiania were associated with an increased dedication to applied botany, or horticulture. Because of the flexible role of museums, science communication—as an exchange of information with museum publics and other audiences—was not limited to passive transmission. While publishing popular texts and articles, growing tool-based collections, and touring exhibitions on horticulture already pushed barriers for what was expected of museological work in 1850's Norway, the conservator and head of the museum and gardens practiced even more forms of knowledge exchange. From creating a network of eighty experiment stations across the country to spearheading the establishment of gardening/horticultural organizations and even developing a patent and business around a machine to produce fish-based fertilizer, the university-based museological institution experimented with various ways to disseminate, enhance, and apply the knowledge it produced. This paper will present an abridged version of my PhD thesis with special focus on the role of museums as it pertains to this type of science communication. Unpacking the practices involved in the execution of these projects can help untangle some of the elements of exchange that reflect on the role of social, cultural, and economic capital and their valorization as they are linked to knowledge institutions like university museums and gardens.

Exploring the lived experiences of students, academics, and staff at the School of Chemistry, University of Glasgow, through oral histories: What can we learn about the everyday culture in our recent past?

Dr Linnea Soler & Dr Smita Odedr

School of Chemistry, University of Glasgow, Scotland, UK

Linnea.Soler@glasgow.ac.uk

Smita.Odedra@glasgow.ac.uk

We are learning, teaching, and scholarship focused academics in the School of Chemistry at the University of Glasgow. As such, we are interested in the everyday interactions and experiences between students, academics, and technical staff because, by understanding the various perspectives and experiences of each cohort, both positive and negative, we gain a deeper understanding of the overall school culture surrounding teaching and learning.

As part of our research into historic traces that inform current teaching practices of chemistry academics, we turn our eye to exploring the historic teaching and learning culture in our school, to uncover, identify, and understand the nuances of the culture that existed 40-50 years ago.

By collecting oral histories of former members of the School of Chemistry through semi-structured interviews, we learn about the day-to-day life in our school, through the lived experiences of students, academics, and technical staff, with a teaching and learning emphasis. While records exist of successful research, scant records exist about those who supported learning; we seek to address this oversight. We are curious about the practical running of the teaching labs, the preparation and delivery of teaching, the perspectives surrounding assessment methods, the support and demands of the time, and the perceived culture.

By exploring our recent past, we may be able to link previous influences on school culture to our existing culture as well as communicate these stories through podcasts, connecting new audiences with our past.

The Guest Book: tracing practical knowledge transfer within a museum's collection

Lisa Sputnes Mouwitz

Student at University of Gothenburg and director of the Medical History Museum in Gothenburg, Sweden.

lisa.mouwitz@vgregion.se

This paper explores what a guest book tells of the Sahlgrenska hospital's surgical department as a place of practical knowledge transfer.

The guest book became part of the Medical History Museum's collection in 2016. The first signature was made by the Swedish queen Victoria in 1918 and was used until 1994. Even though a few royalties wrote their signatures through the years, most of the visitors are fellow M.D.'s and surgeons.

Within the framework of a master's thesis in History of Ideas and Science at University of Gothenburg, I am now focusing on the period around 1932 and onwards which was when the orthopaedic surgeon Sven Johansson (1880-1959) introduced a new technique for treating fractures of the neck of the femur. During these years several international colleagues visited the surgical department and their signatures in the guest book give insight into how practical knowledge of new techniques was shared and spread.

As a relatively newly arrived object, the guest book has a potential in being positioned as a key object, re-connecting other parts of the museum's in many ways fragmentary collections. Objects such as surgical instruments, gifts, letters, photo albums, film etc further confirms knowledge exchange between colleagues. A material that has shown to give an insight also into the staff's and patient's perspectives, production, acquiring and usage of surgical instruments as well as informal exchanges. The international aspect of the material also gives proof of fruitful opportunities to re-connect objects and contexts between medical historical collections across borders.

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Naeem revisits Naeem et al. 1994: reading between the lines of a scientific paper (communication)

Hari Sridhar

Hans Przibram Fellow

Konrad Lorenz Institute for Evolution and Cognition Research, Klosterneuburg, Austria

harisridhar1982@gmail.com

Historians, philosophers, science-studies scholars and scientists have all drawn attention to the mismatch between the *doing* and the *writing* of science (Schickore (2008); *Philosophy of Science*, 75(3), 323-343). As the biochemist Peter Medawar once stated in a talk provocatively titled "Is the scientific paper a fraud?", a paper "misrepresents the processes of thought that accompanied or give rise to the work that is described" (Medawar 1963; *The Listener*, 70, 377-378). As the historian of biology Frederic Holmes warned, papers provide an incomplete picture of scientific practice because they retrospectively construct research activities in ways that don't accurately present the chronology of thinking or experimental steps (Holmes 1987; *Isis*, 78, 220–235) Furthermore, scientific papers downplay or completely exclude the human aspects of science-making in favor of presenting ideas, findings and arguments in a clear and logical fashion for the reader. Motivated by this mismatch, since 2016, I've interviewed the authors of 160 famous papers in Ecology & Evolution (https://reflectionsonpaperspast.com/) to document the papers' back-stories, including origins of ideas and collaborations, choice of materials, daily scientific routines, choice of journals, revisions during the peer-review process etc. In my talk, I will discuss the most salient aspects of the mismatch between the doing and writing of science, and what their epistemic consequences might be.

The Construction of a Collective Fear? Yellow Fever in the German Media from 1800 to 1806.

Jenny Sure

Doctoral Student at the University of Heidelberg (Germany) and research associate in the ERC project "Fever: Global Histories of (a) Disease, 1750-1840)

jenny.sure@zegk.uni-heidelberg.de

Yellow fever is generally confined to tropical and subtropical climates because, as we know today, the mosquitoes which transmit the virus require certain environmental conditions to reproduce. Nevertheless, between 1800 and 1806, a surprising number of publications on the detection and containment of yellow fever boomed in Germany, Austria and other European countries where the disease did not occur. These texts displayed fierce debates over the risk of the often so-called "plague of the Occident" spreading to Central Europe and the measures that should be taken against it. Despite a vague awareness of the hazardous nature of the illness in the West Indies, the issue did not receive significant attention in the German-speaking media until the major yellow fever outbreaks in North America, Spain and Italy around 1800.

Given that the majority of central European authors and officials had no opportunity to personally observe the symptoms, course and social impact of the feverish illness, they depended on the descriptions of mainly American, British, French and Spanish doctors and eyewitnesses who had encountered the disease in the affected areas. They were connected through transatlantic networks of knowledge exchange that included personal correspondences as well as an expansive book trade. Using a wide range of contemporary publications, official decrees and other sources, this paper attempts to explore the influence of media on the development and regulation of collective fears of disease and their realisation in actual government epidemic prevention measures.

Constructing interdisciplinary narratives through a nuclear dark heritage for university students in Japan

Sayuri Tanabashi, Shikoh Shiraiwa, Suzie Thomas

University of Tsukuba, Japan
University of Helsinki, Finland
University of Antwerp, The Netherlands

sayuri.m.tanabashi@gmail.com

Learners of the history of science – whether in primary, secondary, or higher education –represent the future of the scientific community. It is essential that they understand how scientific knowledge and technology were (and have been) used during past wars and global conflicts, so they can adopt such knowledge responsibly in the pursuit of a sustainable society in which we all can coexist. Beyond subject-specific education in science and technology, elements of ethics education should be incorporated into the history of science education to raise awareness of the potential misuse of research findings. Learning and disseminating scientific knowledge and technologies carry significant ethical responsibilities. To date, presenters use the Daigo Fukuryu Maru, the ship exposed to radiation in an American postwar nuclear test and radiation now a nuclear dark heritage site in Japan, as a case study for the history of science education for prompting interdisciplinary narratives. University students visited the museum, guided by curators to think about the relationship between science and ethics, as well as the subject of peace. During group work involving brainstorming sessions and poster tours on sustainable societies through science and technology, university students, despite lacking direct war experience, showed strong interest in peace. Interestingly, those students had not previously explored links between science, technology, and peace, especially when science negatively affects human society along with the natural environment. This presentation concludes that integrating the history of science and ethics education into school, including higher education programs, can foster broader understandings of the relationship between science and peace(-building), fostering a possible solution for a sustainable future.

Gems from the university clutter: Reflections on how to catch and preserve histories of academic material heritage

Anne Vaalund

Museum of University History, a part of Museum of Cultural History, University of Oslo

anne.vaalund@khm.uio.no

In universities, material evidence of academic activities from the past is recognized as clutter on top of cupboards in lecture rooms and labs and are piled together in chaotic storages in the basements. Many historians of science appreciate that the studies of objects give additional insights in their research. As a museum professional, I want to reflect on the process from clutter to asset.

There are not many historians of science in Norway, and even fewer museum professionals dedicated to the history of science. I am a historian and have worked for more than 20 years with the material history of the University of Oslo. Today, many museums find it fruitful to co-curate exhibitions with a community outside the institution. I want to share my experiences with "co-collecting" and "co-registration" in a university. What is gained when a historian works together with different university communities in the selection and registration of museum objects? And where are the barriers when we try to save these insights for future research and dissemination?

Writing About Gender and Women Studies and Their Relation to the History and Historiography of Chemistry

Brigitte Van Tiggelen, Annette Lykknes (presenting author)

Department of Teacher Education, NTNU-Norwegian University of Science and Technology

annette.lykknes@ntnu.no

Some time ago, we were commissioned to write the chapter on women and gender in the history of chemistry for *The Oxford Handbook on the History of Modern Chemistry* (edited by Carsten Reinhardt). As we embarked on this project, we quickly realized that literature on women and gender is far more prevalent in other disciplines than in chemistry. This led us to a fundamental question: What contributions could gender and women's studies bring to the history of chemistry in particular?

As our work progressed, we arrived at several key realizations. Drawing on Hasok Chang's descriptions of the iterative processes in chemistry—where hand and brain, practice and conceptualization, operate in tandem to build an understanding of phenomena—we argue that chemistry's unique methodology has shaped not only a space that women scientists could inhabit but also an environment for gendered practices, for better or worse.

More broadly, situating chemistry within its historical and technological context reveals its role as a material science intimately connected to agricultural advancements, textile and metal production, pharmacology, and the management of resources and governance. As Roberts and Werrett have observed, this positioning makes the history of chemistry a particularly fertile ground for historiographical innovation.

We also examine chemistry's place within the hierarchy of the natural sciences and explore how this disciplinary standing has shaped the experiences of women in chemistry and its subfields.