12 JUNE 2025 09.00 - 11.00

Panel 34. The Good, the Bad, and the Neutral. Exploring the Materiality-Temporality Nexus of Large Technological Infrastructures

Convenors:

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Ginevra Sanvitale, Trinity College Dublin

Keywords: Large technological infrastructures, material politics of technology, materiality, non- human actors, temporality

Technological infrastructures constitute the fabric of our modernity (Edwards 2003; Högselius et al 2016). From communication to transportation, from healthcare to agro- farming, from energy production to border control, most human activities rely on the existence of vast and interconnected sociotechnical systems. Yet, defining what constitutes a "good" infrastructure is a complex task. Occurrences of "infrastructural unrest" (Allen 2021) testify to the conflicted genealogy of many large sociotechnical projects, including their often problematic relationship with the natural environment and with non-human life. But we can also think with new "infrastructural ontologies" that moves beyond anthropocentrism (Barua 2021), and can broaden the conversation on what "good" technoscience could or should be today. Paraphrasing from Kranzberg's laws, infrastructures are «neither good nor bad; nor they are neutral.» (Kranzberg 1986)This panel engages in particular with the material and temporal dimensions of what constitutes "good" infrastructures. The nexus between materiality and temporality helps us understand the agency of human and non-human actors in the making of infrastructures (Hansen and Schulze 2021); fosters engagement with questions of maintenance, repair and decay (Barry 2020, Ramakrishnan et al 2021); and ultimately shows the "unbuilt and unfinished nature" of infrastructures (Carse and Kneas 2019). The materiality-temporality nexus also encourages us to experiment with the spatial dimension, looking beyond and across national boundaries. For example, investigations on the materiality of digital technologies show the existence of global assemblages in digital flows, connecting hardware and software production beyond their traditional separation (Rella, 2023); engaging with the temporal dimension reveals the significance of transnational identity-building narratives in the making of research infrastructures (Mobach and Felt, 2022). Questioning the materiality and temporality of infrastructures not only opens a window into the past, but also into the future, driving us to reflect on professional, humanitarian, and planetary sociotechnical challenges (Balbi 2017; Esguerra 2019). Investigations of the materiality- temporality nexus are thus uniquely suited to challenge ideas of an absolute and timeless "goodness" in technology infrastructures, as well as to expand our definition of what such "goodness" could be.We welcome papers from diverse disciplinary backgrounds which look diachronically (either towards the past or the future) at the relationship between practices and definitions of "good" technoscience and the materiality of large technological infrastructures. How does a technological infrastructure become "good" -or stops being good- throughout the different phases of its life- cycle, from planning, to deployment, to maintenance, to dismissal? What kind of relationships between human and non-human actors are established over time by the materiality of a "good" (or not good) technological infrastructure? How did different political actors assess the sociomaterial impact of "good" or "bad" infrastructure projects through history? Whose values and epistemologies inform(ed) hegemonic discourses on the material politics of future "good" infrastructures? What does a "good" after-life look like, for a dismissed "bad" technological infrastructure?

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ID 178 - Harmonisation, conveniency or mandatory solution? How compatibility shapes networks

Lara Marziali, Politecnico di Milano

Keywords: compatibility, supercomputers, scientific networks, CINECA, INFN, standards

Drawing upon archival documents and interviews, this presentation focuses on the scientific network built before the Internet era in the 1980s, connecting University of Bologna's Departments, CINECA (Interuniversity Consortium of the North-East for Automatic Calculation) and other scientific groups within INFN (National Institute of Nuclear Physics). I address compatibility as an issue that underlines how materiality drove the building of this scientific network. Materiality is here seen through the lens of compatibility: the "harmonizing effect" of interfacing different nodes within a network.

A wide range of studies have shown how standards are important because «they embed ideological and political goals in material infrastructure» (Ward, 2024: 117). The standards war in the Eighties for Internet protocols underlines how the digital is embedded with political gains and denies the presentist and teleological vision of "the winners" (Russel, 2014; Schafer, 2015). Internet has academic roots (Abbate, 1999; Haigh and Ceruzzi, 2021) and one the key-issues in early networks was sharing data between different machines. To solve this, scientific institutions overcame the problem of compatibility through a shared protocol rather than shared code (Haigh and Ceruzzi, 2021: 164).

Before that, when choosing which hardware to buy, an important factor for research institutions was the compatibility of data programs with other systems of the network. This led to favoring some tech companies over others. For instance, the Department of Physics acquired a VAX 11/730 (by Digital Equipment Corp.) because it was the only compatible option with other scientific groups and CINECA's facilities. This shows how the narration of "the best solution in the market" is not neutral and points out other reasons and reasoning in the material structuring of the network e.g., dropping speed in favor of compatibility, two different strategies in scientific computation's market (Elzen and McKenzie, 1994).

Before shared protocols there was the problem of a shared code. Historicizing this issue highlights the different actors at stake, the political and economic weights of each, and the decision-making that shaped a network bounded in the technical capability of the time. With that in mind, I will point out the relative idea of "goodness" lying behind technical choices.

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ID 357 - A taxonomy of avian ruins. Sustainability trade-offs in food systems and the afterlives of poultry industry infrastructures

Ginevra Sanvitale, Trinity College Dublin

Keywords: food systems, ruins and ruination, poultry industry, history of technology

Since the 20th century, industrial food production had a crucial role in providing affordable and diversified nutrients to a growing global population. However, the environmental and societal costs of inexpensive, mass produced food are increasingly under scrutiny. In this paper, I discuss sustainability trade-offs in the food industry by focusing on the materiality-temporality nexus of dismissed poultry production infrastructures. The poultry industry is a prime example of the complex bargain between economic, societal and environmental sustainability which sustains low-cost animal protein production. The modern broiler chicken has been pointed as a marker of the Anthropocene (Nicolaisen 2024), its industry-optimised morphology being a sign of the profound impact that the human specie had on the natural environment. From a societal perspective, the poultry industry provides a much needed source of income to impoverished communities, but can also contribute to their further marginalisation (Gray 2014, Piro and Sacchetto 2021).

I present a case study on the company Cip-Zoo (1957-1984), which pioneered industrial poultry production in Italy. By looking at the afterlives of its production infrastructure, I draw a taxonomy of avian ruins meant to explore how dismissed poultry industry locations can become either "sites of dispossession," which remain bounded to circuits of capital accumulation and ruination, or "sites of hope" for imagining and practising new political ecologies (Harris and Mullenite 2024). I focus on three different locations –a farming site, a slaughterhouse, and a feed production site– highlighting their historical significance within Cip-Zoo's productive infrastructure, and how the sustainability challenges which accompanied their life-cycle changed during their afterlives.

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ID 366 - Following the rocket around: Towards a material-temporal topography of large-scale infrastructures

Nina Klimburg-witjes, Universität Wien
Joseph Popper, Universität Wien

Keywords: Large-Scale Infrastructures, Infrastructural ethnography, temporality-materiality nexus, European integration, Outer Space

This paper examines the material-temporal dimensions of large infrastructures and their politics through a topographical analysis of the European Ariane 6 rocket, jointly built by 13 countries. Rockets do not simply ascend; they carry with them an entire network of interests, resources, and infrastructural- and power relations. Following the rocket from political negotiations to European factories and its transatlantic journey by ship to the spaceport in French Guiana, we explore how the Ariane 6 embodies shifting scalar narratives and contested visions of European integration, geopolitical positioning, and infrastructural dis/continuity. We situate the rocket within broader debates on the material politics of large-scale technological systems, highlighting the tensions between its promise of a competitive European space future and the logistical, environmental, and political frictions that shape its development and deployment. By linking STS, infrastructure studies, and Social Studies of Outer Space, our analysis foregrounds how the materiality-temporality nexus of Ariane 6 reflects broader questions about the adaptability, imagined futures, and afterlives of (space) infrastructures. Through this lens, we interrogate the epistemic binaries that separate Earth from space (Battaglia 2005; Messeri 2016), showing how Ariane 6 operates within and is shaped by ongoing discussions about what constitutes a "good" or "failed" European infrastructure in the new space race. Building on a multi-modal body of material collected over two years, we discuss how Ariane 6 embodies contradictions between accelerationist imaginaries of technological progress as put forward by

commercial actors in the US and slower, recursive processes of adaptation, socio-technical compromise associated with the European space sector. Understanding the Ariane rocket as a site of infrastructural contestation, we reflect on the "unbuilt and unfinished nature" of infrastructures (Carse and Kneas (2019) in relation to imagined outer space futures and European integration practices on the ground.

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ID 489 - Neither market nor hierarchy... nor network: Thinking around network forms of organisation.

Ashwin Mathew, King's College London
Elisa Oreglia, King's College London

Keywords: networks, technology stack, logic of networks, Chinese technologies, internet infrastructure

Networks are commonly characterised as heterogeneous collections of interconnected entities, with emergent - rather than pre-determined - structure (Clark 2018). Although there are significant insights that have been drawn from this loose definition, whether theoretical (e.g., ANT), empirical (e.g., social network analysis) or political (e.g., "network society"), we argue that existing approaches to defining networks limits a fuller set of analytical categories that are needed to make sense of phenomena that might also be described as networks. To make our argument, we build from our research into the technical communities who operate global Internet infrastructure, and into the expansion of Chinese networked technologies across Southeast Asia. In doing so, we raise questions of when and for whom networks are "good", and how the very notion of "good" infrastructures is contested across multiple actors and scales.

In particular, we draw attention to institutional and ideological imbrications, intertwined modularities and longue durée perspectives as factors necessary, and yet often overlooked, to a more expansive understanding of networks, especially when viewing them as a means through which to understand digital infrastructures. From an institutional and ideological perspective, we show how networks often rely on centralised institutions for the development of standards and the allocation of unique identifiers, and how different ideological frames - in this specific case, the US and the Chinese one - provide a different cultural coherence to similar technological assemblages. From a modularity perspective, we argue that networks must be viewed as stacks of related technologies, each with their own interdependencies, rather than only graphs of connectivity, which complicates the view of "Western" versus "Chinese" tech stack. We approach these topics from the perspective of the longer histories and slower times of accretion of material infrastructures through which seemingly spontaneous digital networks get produced, and reflect on their consequences for our understanding of networks in a polarized world.

By introducing these analytical categories, we aim to provide a new lens to understand how networks are implicated in, and produced through, broader sets of non-network relations, many of which cannot be accounted for within the conventional logic of networks. In doing so, we hope to open a new path towards understanding the distinctiveness of network forms, while placing them firmly within the worlds that produce them.

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ID 742 - Assembling timelines in 1997 Italy. The biography of a fragment of TV infrastructure on the verge of digital transition.

Simona Casonato, Museo Nazionale Scienza e Tecnologia Leonardo da Vinci, Milano

Keywords: material culture, media infrastructures, historicisation, convergence

My paper draws on the concept of the cultural biography of things (Kopytoff, 1986). I focus on a made-in-Italy device from the 1990s, during the inception of the digital transition: a specimen of "Regia Automatica" ("automated TV direction", RA), a machine to automate timelines scheduling in small TV broadcasting stations.

I propose the reconstruction of the network of relations surrounding the artefact as a way to explore the materiality-temporality nexus.

The RA derives from Mega Cart Players (MCP), US-made machines with robotic arms for automatic playback of archival magnetic tapes, built and marketed from the end of 1980s (Sinden, 1989). Imported in Italy around 1995, the MCP technology underwent an artisanal adaptation into the context of small private Italian TV networks. 'Our' RA is the result of this process: it was produced in 1997 by Elettronica Industriale (EI), a technical branch of Mediaset (owned by the entrepreneur and politician Silvio Berlusconi). The company used to sell the device to regional broadcasters, even competitors. Our specimen was used until 2007 by one of them and is now part of the Museo Nazionale Scienza e Tecnologia Leonardo da Vinci collections.

Under the broad umbrella of media archaeology, many authors recently looked in manifold ways at the material side of communication, often under a hands-on framework and mainly reflecting on old and new media concepts (a most reductive list could be Parikka, 2012; Fidotta & Mariani, 2018; Magaudda & Minniti, 2019; Fickers & Oever, 2022). However, pieces of old communication infrastructures that cannot be easily operated can be analysed through the material culture lens as it is classically understood in memory institutions (Kingery, 1996; Desvallées, 2023). Hence my focus is less on a closing approach – such as in reenactments – than on the socially informed exercise of reconstructing the biography of a "material individual" singularised as a museum cultural good (Volonté, 2009); thus, programmatically frozen as document of the past, as recent as it may be.

By narrowing the scope to a single 'remote' artefact, my aim is to inquire on specific interpretations of goodness in technological innovation with respect to the history of the digital revolution, a powerful techno-utopian paradigm (Balbi, 2022). The lifespan of our RA coincides with the rise of the "new media" paradigm and the establishment of discourses about the digital convergence (see e.g. Negroponte, 1996; Manovich, 2001). The case illustrates how such transformations were materially interpreted in some specific socio-economic and technological contexts: the RA machine embodies an artisanal and labile convergent patchwork, a hybrid assemblage of mechanical, electronic, analogue, and digital solutions, reflecting specific interactions between diverse knowledge systems, production chains, and power structures. The reconstruction of its biography throughout a collegial memory effort follows a museum proved scheme, aimed to include the perspective of a variety of actors (Casonato, 2024). This process contributes to illuminate how the global phenomenon of convergence materially came into being in that corner of South Europe, questioning its universal meaning and its trajectories in time.

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ID 803 - Technoscience for the regional: infrastructuring a predictable Mediterranean

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Keywords: ocean sciences, ocean technologies, Mediterranean Sea, Earth System Sciences, co-production

In this paper I problematize technological infrastructures dedicated to Earth surveillance, arguing that the nature of seemingly worldwide observation systems that sustain modern Earh System Sciences (ESS) is not homogeneous but historically and geographically situated. By reconstructing the recent history of oceanographic forecast in the Mediterranean Sea in a context of global environmental ambitions, I show how a basin-wide approach to the history of ocean science and technology may enlighten the nexus of the material, spatial and temporal dimensions of technoscience that link the regional and large-scale perceptions of global change.

Environmental monitoring technologies deployed over the second half of the 20th century portrayed a totalizing image of the Earth as a self-evident, knowable and manageable system. Against this overly naive conception of technology that detaches knowledge-making from world-making practices, the widespread analytical categories of the 'technoscientific', the 'technopolitical' and the 'envirotechnical', have been foregrounded to advocate for a complex picture of how science, technology, politics and the environment are

co-produced at a planetary scale. In this proposal I offer a critical engagement with these concepts from a regional lens, arguing that the construction of the planetary as a scale of technology-driven transformations is a historical and epistemological process that grows from back-and-forth feedback with regional-scale actors.

Illustratively, the uniqueness of the Mediterranean Sea and the science conducted therein, located in the middle grounds between the coastal imaginaries of the sea and the incommensurability of the world ocean, appears as a sensible choice to trace the conflicted and heterogeneous spatiotemporal scales implicitly underlying the meaning of a planetary-wide surveillance infrastructure. Over the 1990s, the Mediterranean community became the epicentre of a transition within the discipline of oceanography towards short-term predictive modelling systems that reflected the mismatch between the intended global, long-term scope of ESS and the scale of the available infrastructural capabilities.

Starting in the 1980s, the possibility of real-time prediction of the state of the ocean, namely operational oceanography, was hypothesized as the oceanic analogue of atmospheric weather forecast. Despite the increasingly globalized agenda of the oceanographic community set by ESS, the development of regional marine infrastructures and institutional arrangements at more manageable sizes and in highly populated areas, like the Mediterranean Sea, were instrumental in channeling the demands for marine forecasts into a feasible enterprise.

The predictive power of operational oceanography was restricted to the Mediterranean scale, as it was entirely reliant on in-situ marine sensing technologies, but the invested efforts leveraged and balanced the divergent directions of global ESS and Mediterranean oceanography. This episode reveals how the materiality and temporality of large technological infrastructures impose technical and ontological constraints to the chimera of an infinitely comprehensive understanding of the Earth and force compromises with more tangible humanly scales to overcome such limitations.