

# Disentangling Futures from a Science and Technology Studies Perspective

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**Abstract:** In the last decade, science and technology studies have paid increasing attention to the role of futures, anticipatory expectations, and forward-looking statements in co-defining the nexus between science, technology and society. This broad interest is articulated into several research streams, from the assessment of long-term futures of technological innovation and setting out how future-oriented socio-technical imaginaries act upon real-time technoscientific innovation to actionable anticipatory frameworks and scenarios adopted to intervene in science, technology and innovation governance. This paper introduces the special section *Disentangling Futures*, which collects four lectures from the teaching and mutual learning activities held during the VI STS Italia Summer School, organised at the University of Padova in September 2022. By situating the four lectures within a composite conceptual framework, the paper discusses the relationship between the future and technoscientific processes in the context of science and technology studies with an emphasis on the performative role of futures and imaginaries in co-shaping knowledge-making practices and technological developments.

**Keywords:** future; technoscientific expectations; socio-technical imaginaries; promises; art-science collaborations.

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## I. Introduction

In which ways and under which conditions do socio-technical expectations, promises and imaginaries co-shape the nexus between science, technology and societies? How are future scenarios entangled with policymaking and decision-making processes about technoscientific innovations and

developments? In which ways can art, exhibitions and “art–science” experiments cross-fertilise the understanding of social, cultural and ethical issues at stake in the context of new and emerging sciences and technologies? Such questions are currently at the core of several research streams at the intersection of science and technology studies (STS), the sociology of expectations, and media and cultural studies that are concerned with analysing how and to what extent promissory narratives, forward-looking statements and expectations are not only hypothetical discursive entities navigating towards uncertain and unfathomable future scenarios but also performative objects at work in real-time practices (Konrad et al. 2017).

This special section of “Tecnoscienza” hosts four invited lectures from the teaching and mutual learning activities held during the VI STS Italia Summer School titled *Disentangling Futures: Promises, Scenarios, Experiments* organised at the University of Padova in September 2022.<sup>1</sup> The scientific programme of the summer school were deeply entangled with an ensemble of analytical issues, theoretical perspectives and concepts that in the last few years have emerged with renewed vitality in the STS field with the aim of respecifying the analytical lenses and methodological approaches in the understanding of technoscientific innovation processes – i.e., how the performative role of futures, anticipatory expectations and imaginaries is actively engaged in co-shaping knowledge-making practices and technological developments.

In the context of STS, the identification of the future as an analytical focal point for analysing technoscientific phenomena surfaced around the 1990s and split into several research streams. This fertile debate, which explores how real-time technoscientific practices mobilise and intertwine with future-oriented narratives, has provided a conceptual scaffold for the teaching and mutual learning activities carried out during the VI STS Italia Summer School in Padova. Such activities have coalesced within the lectures collected in this special section that covers various issues, from the assessment of long-term futures of technological innovation that helps scholars and policymakers consider how future-oriented socio-technical imaginaries act upon real-time technoscientific innovation to actionable anticipatory frameworks and normative scenarios adopted to intervene in science, technology and innovation governance and policymaking.

The conceptual scaffold of the summer school – as the four lectures outline – relies on the acknowledgement that the research body about the role of imaginaries, discourses and practices related to the construction of technoscientific futures is increasingly articulated. In this respect, a crucial turning point in the STS literature about the role of the narrativisation of the future can be traced back to the early 1990s with the emergence of a distinctive *sociology of expectations* pioneered by Harro Van Lente (1993) in his widely cited PhD thesis. In subsequent years, this seminal work evolved into a broad research stream intensely focused on the role of future-oriented narratives as a crucial element in sustaining the

mobilization and alignment of material and immaterial resources, skills and public interest around emerging, and sometimes controversial technoscientific fields, such as synthetic biology, nanotechnology and post-genomic developments (Brown et al. 2000; Burop et al. 2006). A wide array of concepts and perspectives have emerged to advance the study of the performative nature of future-oriented technoscientific expectations and visions. Performativity here refers to the relevance of considering and locating anticipatory knowledge and future-oriented visions within the multiple dynamics of real-time innovation practices. Such practices give shape to heterogeneous networks in which diverse agents can cooperate and conflict by mobilising various resources (e.g., available technologies, financial means, legal frameworks, scientific evidence and deliberative procedures) as well as visions and expectations about suitable or undesirable futures to acquire support for materialising their ideas in cogent and actual scenarios that may orient everyday research activities and living experiences (Brown and Michael 2003; Michael 2000).

More recently, the notion of *socio-technical promises* has gained further relevance among scholars and policymakers interested in understanding how the management of visions related to futures – which also embed values, ethical statements and notions about potential benefits or disadvantages arising from innovations – is actively performed by research and innovation communities within a “promissory regime” (Apredda et al. 2014; Audétat et al. 2015). Following this line of inquiry, concepts such as “promissory organizations” (Pollock and Willimas 2010) and “promissory bio-objects” (Crabu 2014) have been elaborated to enhance the understanding of the relationships between anticipatory knowledge, technoscientific expectations and forward-looking statements on the one hand, and the sociomaterial dimension of knowledge-making practices and technological innovation on the other.

Within this perspective, the notion of *socio-technical imaginaries* (Jasanoff and Kim 2015) became widely adopted to address the implications and dynamics related to the narrativisation and symbolic dimension of technoscience in society. The notion of socio-technical imaginaries allows scholars and practitioners to address and disentangle how the social, normative and institutional future-oriented visions and expectations can influence and orient collective choices, preferences, values and behaviours about what is desirable and appropriate or inappropriate in the context of our everyday technologically dense societies (see Bruni et al. 2013).

Within this ongoing debate about the role of imaginaries in the context of science and technological innovation, the four lectures comprising this special section further contribute to disentangling the ways in which anticipatory expectations and forward-looking statements may act as discursive devices capable of reshuffling and reshaping the modalities and conditions under which various stakeholders and concerned groups of people manage real-time technoscientific issues. It is worth noting that

the narrativisation of technoscientific innovation seems to be particularly relevant when breakthrough devices, research programmes and emerging scientific fields are increasingly exposed in the public sphere to manufacture legitimacy and social acceptance of innovations (e.g., human genome editing, human enhancement and self-driving car).

While expectations are crucial in framing and co-defining the settings, conditions and arrangements within which technoscientific phenomena occur, in the lecture *The Roots of Neglect: Towards a Sociology of Non-Imagination*, Barbara Prainsack (2022) makes the case that the lack or absence of (alternative) expectations may also have a role in shaping the future itself. Starting from the widely accepted assumption that the performative power of visions and expectations can orient the multiple ways of being, knowing and intervening in our everyday dense societies (e.g., which projects to finance, who should handle them, who should enjoy their benefits, and who should be responsible for any negative consequences), Prainsack shows how the absence of desirable counter visions and narratives about the future can explain why concerned group of people do not trigger a change of highly questionable socio-technical regimes and related arrangements that can be perceived as detrimental to human and planetary well-being. Hence, in outlining a *sociology of non-imagination*, Prainsack calls for the need to analyse and understand the ways in which the absence of counter-visions defines the scaffold for the perpetuation of various forms of injustice and exploitation of people and the environment.

By opening a critical reading of the anticipatory governance perspective, this lecture allows us to consider another crucial dimension of the VI STS Italia Summer School, namely the collective experiments that can help us address the role of the narrativisation of the future, intended not only as a tool deeply subsumed by hegemonic neoliberal technoscience but also as a potential trigger for new critical and reflective perspectives on the interrelations between science, technology, politics and society. In particular, experiments in the co-creation and creative appropriation of scientific knowledge and technologies have paved the way for new forms of public engagement and inclusion in various technoscientific domains, thus leading to a reassessment of the interrelations between science, technology and society, while framing citizens and diverse stakeholders as active agents in shaping new potential configurations of the science-society relationship (Lezaun et al. 2017; Marres 2012).

The focus on the imaginative power of experiments and other novel trajectories of interaction between societal actors and research and innovation communities leads us to another key dimension addressed in the context of the summer school and then elaborated by the aforementioned lectures: the role of fictional narratives. Fictional representations of technoscience – including movies, literature and comics – have already started to be integrated into the analysis of emerging innovations. For example, this can be observed in studies on popular culture representations of

emerging innovations such as human cloning (Nerlich et al. 2001) and nanotechnologies (Millburn 2008). This body of research also highlights how scientists themselves can be directly or indirectly engaged in fictional imaginative production (Kirby 2011). As outlined by Marc Aud  tat (2022) in his lecture titled *Promising Technosciences in the Economy of Attention*, fiction should be considered tools for re-imagining counternarratives or counterfictions that can trigger imaginative processes useful for developing new theoretical lenses that can be used to better understand contemporary technoscience. In his contribution, Aud  tat introduces a fresh dialogue between cultural and media studies and STS to expand the sociology of expectations and focus on how technoscientific visions can gain public resonance and popularity by circulating within the public sphere. Starting from this analytical premise, Aud  tat elucidates how and under what conditions technoscience is framed as a matter of promising and visionary practices and discusses the implications raised by such practices in respecifying the interface between science and society.

Following this line of inquiry about highly mediated and spectacularised technologies, a lecture by Philippe Sormani (2022) titled *Remaking Intelligence? Of Machines, Media, and Montage* critically reflects on the current renewed interest in artificial intelligence, especially machine learning techniques, as a technoscientific field marking the spectacular revival of automated induction. Sormani mobilises an ethnomethodological approach and develops a practice-based video analysis of a demonstration of “machine intelligence.” By examining the complex interplay between machines, media and montage, the lecture highlights how specific forms of “enchanted determinism” (Campolo and Crawford 2020) are enacted as situated performance.

A final point at the centre of the summer school, articulated in the closing lecture by Silvia Casini (2022) titled *That Obscure Object of Desire: Some Notes for a Slow Art-Science*, concerns the role of art and artistic exhibitions in shaping and understanding technoscientific-driven innovation processes (see Halpern et al. 2022; Sormani et al. 2018). As outlined by Casini, art-science collaborations can be considered privileged loci for experimenting with new visions and imaginaries about technoscience. As such, art-science collaborations elicit critical reflections about the nexus between science, technology, politics and society and invite us to dismantle and cross epistemic, disciplinary and professional boundaries. By highlighting the transformative power of art-science-based experimentation and critically overcoming na  ve conceptions of creativity, Casini adeptly outlines art-science collaborations as a strategy for cross-fertilizing and reframing strategies of engagement in technoscience.

Overall, this special section invites scholars, policymakers and concerned stakeholders to rethink the role of expectations and future-based narratives in innovation dynamics, thus reopening the doors of science and technology to unexpected agents, discourses and skills. This is urgent,

since contemporary challenges such as the current global climate, health, social and political crises not only necessitate assessments of the temporality of technoscientific innovation processes in the present, with their controversies and conflicts, but also imply the need for a collective and creative effort to draw more sustainable and socially desirable futures.

## Notes

<sup>1</sup>The VI STS Italia Summer School was held in Padua from 27 September to 1 October 2022 and was organised by STS Italia in collaboration with the Department of Philosophy, Sociology, Pedagogy and Applied Psychology (Fisspa), the Padova Science Technology and Innovation Studies (Pa.S.T.I.S.) research unit of the University of Padua, the STS Lab of the University of Lausanne with the support of the European Association for the Study of Science and Technology (EASST) and the journal “Tecnoscienza.” See <http://www.stsitalia.org/6th-sts-italia-summer-school-disentangling-futures-promises-scenarios-experiments-27th-to-october-1st-2022-padova-italy/>.

## References

- Apreda, R., Bonaccorsi, A., Fantoni, G. and Gabelloni, D. (2014) *Functions and failures: How to manage technological promises for societal challenges*, in “Technology Analysis & Strategic Management”, 26(4), pp. 369-384.
- Audétat, M. (2022) *Promising Technosciences in the Economy of Attention: Why Have Pessimistic Stories of Disruption and “Artificial Intelligence” Performed so Well?*, in “Tecnoscienza”, 14(2), pp. 35-56.
- Audétat, M. (ed.) (2015) *Sciences et technologies émergentes: Pourquoi tant de promesses?*, Paris, Hermann éditions.
- Borup, M., Brown, N., Konrad, K. and Van Lente, H. (2006) *The Sociology of Expectations in Science and Technology*, in “Technology Analysis & Strategic Management”, 18 (3-4), pp. 285-298.
- Brown, N., Rappert, B. and Webster, A. (eds.) (2000) *Contested Futures: A Sociology of Prospective Techno-Science*, Aldershot, Ashgate.
- Brown, N. and Michael, M. (2003) *A sociology of expectations: Retrospecting prospects and prospecting retrospects*, in “Technology Analysis & Strategic Management”, 15(1), pp. 3-18.
- Bruni, A., Pinch, T. and Schubert, C. (2013) *Technologically Dense Environments: What For? What Next?*, in “Tecnoscienza”, 4(2), pp. 51-72.
- Campolo, A. and Crawford, K. (2020) *Enchanted Determinism: Power without Responsibility in Artificial Intelligence*, in “Engaging Science, Technology, and Society”, 6, pp. 1-19.
- Casini, S. (2022) *That Obscure Object of Desire: Some Notes for a Slow Art-Science*, in “Tecnoscienza”, 14(2), pp. 87-104.
- Crabu, S. (2014) *Nanomedicine in the Making: Expectations, Scientific Narrations and Materiality*, in “Tecnoscienza”, 5(1), pp. 43-66.

- Guston, D.H. (2014) *Understanding “anticipatory governance”*, in “Social Studies of Science”, 44(2), pp. 218-242.
- Halpern, S., Hannah, M. and de Ridder-Vignone, D. (eds.) (2022) *Routledge Handbook of Art, Science, and Technology Studies*, New York and London, Routledge.
- Jasanoff, S. and Kim, S-H. (eds.) (2015) *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, Chicago, University of Chicago Press.
- Kirby, D.A. (2011) *Lab Coats in Hollywood: Science, Scientists, and Cinema*, Cambridge, MIT Press.
- Konrad, K., Van Lente, H., Groves, C. and Selin, C. (2017) *Performing and Governing the Future in Science and Technology*, in S. Jasanoff, G.E. Markle, J.C. Peterson and T. Pinch (eds.), *Handbook for Science and Technology Studies*, Cambridge, MIT Press, pp. 465-493.
- Lezaun, J., Marres, N. and Tironi, M. (2017) *Experiments in Participation*, in U. Felt, R. Fouche, C. Miller and E. Smith-Doer (eds.), *Handbook of Science and Technology Studies*, Cambridge, MIT Press, pp. 195-222.
- Marres, N. (2012) *Material Participation: Technology, the Environment and Everyday Publics*, London, Palgrave.
- Michael, M. (2000) *Futures of the present: From performativity to prehension*, in N. Brown, B. Rappert and A. Webster (eds.), *Contested Futures: A Sociology of Prospective Techno-Science*, Aldershot, Ashgate, pp. 21-39.
- Millburn, C. (2008) *Nanovision, Engineering the Future*, Durham, Duke University Press.
- Nerlich, B., Clarke, D. and Dingwall, R. (2001) *Fictions, fantasies and fears: The literary foundations of the cloning debate*, in “Journal of Literary Semantics”, 30, pp. 37-52.
- Pollock, N. and Williams, R. (2010) *The business of expectations: How promissory organisations shape technology and innovation*, in “Social Studies of Science”, 40(4), pp. 525-548.
- Prainsack, B. (2022) *The Roots of Neglect: Towards a Sociology of Non-Imagination*, in “Tecnoscienza”, 14(2), pp. 13-34.
- Rip, A. (2006) *Folk Theories of Nanotechnologies*, in “Science as Culture”, 15(4), pp. 349-365.
- Sormani, P., Carbone, G. and Gisler, P. (eds.) (2018) *Practicing Art/Science: Experiments in an Emerging Field*, New York and London, Routledge.
- Sormani, P. (2022) *Remaking Intelligence? Of Machines, Media, and Montage*, in “Tecnoscienza”, 14(2), pp. 57-85.
- van Lente, H. (1993) *Promising Technology: The Dynamics of Expectations in Technological Developments*, PhD Thesis, University of Twente, Enschede.