**The Concept of Imaginaries in Science and Technology Studies**

**Maureen McNeil, Michael Arribas-Ayllon, Joan Haran, Adrian Mackenzie, Richard Tutton**

**Introduction**

In this chapter we explore the use of *imaginaries* as an analytical concept within STS, which has grown in use and significance in the last three decades [figure 1.1 here]. While it is difficult to begin such a project without offering a working definition of the concept, questions about its definition abound and these have helped to shape the various deployments of the term. Catherine Waldby offers one particularly useful definition relevant to the use of the term in STS: ‘the deployment of, and unacknowledged reliance on, culturally intelligible fantasies and mythologies within the terms of what claims to be a system of pure logic’ (Waldby 2000, 137).[[1]](#endnote-2) Nevertheless, variations in interpretation and usage of the term are considered in this chapter and we try to decipher the significance of these. One reason for our exploration is that the concept is frequently used without reference to a theoretical genealogy or an explicit methodological repertoire, but with, nonetheless, a strong sense of the phenomenon. Sheila Jasanoff’s recent commentary is exceptional in laying out ‘theoretical precursors’ and ‘major methodological approaches’ (2015a, 6) for her version of the concept (see also Harvard University 2015; Nerlich and Morris 2015).

The following sections provide a variety of perspectives on the concept of imaginaries to situate, reflect on, and enrich STS use of the concept. We begin with an overview of the use of the concept in STS. We then offer a set of reflections about the etymology of the term and this is followed by a set of genealogical tracings. The last two sections in turn, analyze some strands of STS work deploying the concept and consider issues raised by its usage within STS research. Figure 1. 2 maps the complex terrain covered in this study. Our tracking, genealogy and reflections derive from the emergence of the concept predominantly with reference to science and technology in Euro-Western contexts. Nevertheless, we do draw attention to notable STS research deriving from the study of other cultures, including of Australian aboriginal (Verran 1998), South Korean (Jasanoff and Kim 2009), Japanese (Fujimura 2003; Mikami 2014) and Indian (Prasad 2014) contexts.

**Etymology and STS deployments**

Tracing the etymology of the adjective *imaginary* yields a fascinating account of the conceptual interface between notions of reality, thought and images. The *Oxford English Dictionary* (2009) gives the contemporary definition as: ‘existing only in the imagination or fancy; having no real existence; not real or actual’, which is remarkably consistent with its original meaning (classical Latin imāginārius) as ‘a mere semblance, unreal, fictitious, pretended.’ The semantic diversity of imaginary has survived through its adjectival use as relating to *imagination*, implying ‘having no real existence.’ As these definitions suggest, imaginary properties are often deemed to be irrational or arbitrary and therefore not to offer reliable accounts of reality.

However, there are two notable developments involving more positive meanings of imaginary. From the 12th century, various usages among British sources begin to denote the faculty of imagination as a specific kind of thought (e.g. ‘imaginable, thinkable’) which is a direct antecedent of contemporary accounts of cognition and creativity. Appearing at the end of the 16th century, *imaginaries* is frequently used in the plural to denote ‘an imagination; a fancy; something imagined’. The plural form also appears in the 18th century to designate ‘an imaginary quantity or expression’ in mathematics. Hence, early definitions pertained to the interface between thought and reality, where imaginary designates a frivolous or inconsistent mapping between the two domains. The term is also frequently used in poetry and personal narratives associated with introspection, reflection or affective writing. Nearly all examples of usage refer to processes of or about individuals; there is no indication that imaginaries refer to collective processes until the 20th century.

The pluralization and nominalization of the term follows an historical pattern characterized by the increasing conceptualization of abstract processes. That is to say, the adjective *imaginary* is transformed from a word which describes processes pertaining to reality to one associated with interpretations of reality. To illustrate this, the *OED* cites a recent (1999) example of the noun form: ‘Such “imaginaries” are crucial because they shape urban development patterns.’ The source for this is a publication of *Friends of the Earth*, a UK environmental campaigning organization. The term appears in quotes indicating technical terminology. As the grammatical agent in the clause, it is registered as acting upon ‘urban development patterns’, which is itself a complex noun. In this example, *imaginaries* seem to denote objects or patterns of thought that have an influence on wider social processes. It is this sense of the term -- conceptualizing significant and sometimes abstract social processes -- which resonates with STS usage.

Recent iterations of imaginaries in academic work often appear in conjunction with a modifier. For example, Le Doeuff (1989) writes of ‘the philosophical imaginary.’ Some political and social theorists (including Charles Taylor) have added the label ‘social’. STS scholars have offered their own specifications, most notably Jasanoff and Kim’s (2009) rendering of ‘sociotechnical imaginaries’. Franklin (2000) and Stacey (2010) specify ‘the genetic imaginary’ and Waldby’s coinage is ‘biomedical imaginary’ (2000), while Steinberg (2015) invokes ‘bioimaginary’, and some anthropologists favour ‘medical imaginary’ (Good 2010).

Questions can be raised about the usefulness of some of these modifiers. First, as the following analysis will suggest and as many of those using the term within STS indicate, all imaginaries are necessarily ‘social’. In this sense, the addition of ‘social’ may be rather superfluous.[[2]](#endnote-3) However, in labeling imaginaries ‘social’, STS researchers emphasize their collective nature and draw attention to embedded visions of the social in operation in particular technological and scientific developments or regimes.

There are similar issues around the attachment of the adjectives *scientific*, *technical* or *technoscientific* to imaginaries in STS work. Since the focus of such research is scientific and technological, this qualifier sometimes seems redundant. However, the framing of imaginaries as technoscientific may be a way of asserting that such imaginaries are embedded in the science and technology being investigated. Such labeling challenges assumptions about technoscience as exclusively the realm of facts and, hence, disturbs common assumptions about science as ‘a system of pure logic’ (Waldby 2000, 137).

Moving from these features of STS terminology, the next section surveys some sources which have inspired and sustained the field’s research on imaginaries.

**Genealogies of ….**

A number of streams of theory can be traced in the genealogy of the concept of the imaginary. Our review registers the complexity of the concept’s genealogy and derives from references and affiliations cited in STS. However, it also tracks streams that have not explicitly deployed the term, but which are significant for its usage in STS. We have identified the following as key genealogical resources:

* Western philosophy: Kant, Sartre, Le Doeuff
* psychoanalysis
* late C20 political philosophy
* science fiction

# *Western philosophy: Kant, Sartre, Le Doeuff*

# Reflections on imaginaries can be traced as a narrow, but significant thread in Western philosophy. This leads back to Kant’s demarcation of ‘the real’ from ‘the imaginary’ which became a touchstone for modern Western science and re-emerges with notable contributions from existential and feminist philosophy in the 20th century.

Jean Paul Sartre’s *The Imaginary: a Phenomenological Psychology of the Imagination* (1940; 2004) was the first work to systematically explore the psychological domain of the imagination. For Sartre, the imaginary was the sphere and set of psychological and mental operations associated with imagination. Although not cited in the STS research we have consulted, Sartre’s text is important because of its designation of the imaginary as a distinctive and powerful domain. By delineating how imagination differed from perception, Sartre was identifying its key features, but also insisting on its importance as a parallel mode of knowing. Hence, he brought the term imaginary into critical political discourse, proposing it as a vital sphere of mental operations and knowledge production. Sartre’s exploration proved to be an important resource for both philosophical and psychoanalytic investigations.

Another much later philosophical text, which has been influential in STS research is Michèle Le Doeuff’s *The Philosophical Imaginary* (1980; 1985). Le Doeuff’s critical re-reading of Western philosophy, including her account of Kant’s paradoxical use of imagery and metaphor to characterize modern reason as requiring the exclusion of the imaginary, has been particularly important for feminist STS, as we show below.

*Psychoanalytical routes*

Lacan’s conceptualization of the imaginary as a psychic realm of subjective identification with images that exist prior to identification through language emerged almost concurrently with Sartre’s. Lacan accounted for subjective misrecognition of the self’s unity and coherence through his positing of the mirror stage of psychic development in which the young child views him or herself in the mirror and identifies with the specular image. He maintained that this takes place before language acquisition so that the ego is formed ‘prior to its social determination, in a fictional direction’ (Lacan 2006, 76). Lacan (2006, 75) asserted that by understanding this experience, psychoanalysis is ‘at odds with any philosophy directly stemming from the *cogito.*’ In his 1936 essay – having suggested that the imaginary can only be brought fully into consciousness through psychotherapy – Lacan (2006, 70) claimed that: ‘physical science, as purified as it may seem in its modern progress from any intuitive category, nevertheless betrays, indeed all the more strikingly, the structure of the intelligence that constructed it.’

STS has had limited engagement with the psychoanalytic tradition in its use of the concept of imaginaries. The Harvard Imaginaries project website (http://sts.hks.harvard.edu/research/platforms/imaginaries/) does reference Lacan and, as discussed below, a number of feminist researchers have drawn on this tradition, but otherwise, it has not been a main resource for STS. Nevertheless, Lacanian psychoanalysis’ identification of the imaginary with the fragmentary character of subjectivity draws attention to the mediated nature of knowledge production (attending particularly to images) and, as some STS scholars have noted, psychoanalysis has made a significant contribution to the conceptualization of subjectively experienced collective imaginaries.

# *Late twentieth-century political philosophy: ‘new imaginaries’*

As we detail below, STS scholars have relied mainly on political philosophy in their investigations of the imaginary. Primary reference points have been the work of Benedict Anderson, Cornelius Castoriadis, and Charles Taylor. However, in this section we suggest an extended profile of influences.

Benedict Anderson’s *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (1983) has inspired a number of STS researchers, as well as myriad other political theory and cultural studies analysts. His key insight was that nations were: ‘*imagined* because the members of even the smallest nation will never know most of their fellow-members, meet them, or even hear of them, yet in the minds of each lives the image of their communion’ (Anderson 1983, 15).

Although he does not explicitly use the term ‘imaginary’, Anderson’s historical reflections brought collective imaginative capacities to the fore as vital elements in the making of nations. Anderson (1983, 49) contended that: ‘the convergence of capitalism and print technology on the fatal diversity of human language created the possibility of a new form of imagined community, which in its basic morphology set the stage for the modern state.’ Anderson’s general conceptualization of how collective imaginary capacities are generated and sustained has had considerable resonance for STS analysis of imaginaries. His work suggests that in analyzing *scientific* imaginaries, it may be important to explore both the communication processes and the media that enable/instantiate these imaginaries. Moreover, Anderson’s influential investigation of nation formation has been linked to technoscientific imaginaries in another way. Despite claims about the universality of science, as Jasanoff and Kim (2009) and other STS researchers have demonstrated, technoscientific imaginaries are often cast with reference to nations.[[3]](#endnote-4)

While Anderson was in dialogue with other Marxists regarding theorizations of nations, Castoriadis’s approach to the imaginary emerged from his dissatisfactions with late twentieth-century Marxism. He articulated new ways of thinking about the ‘revolutionary project’ with reference to the ‘institution of society’ (Castoriadis 1987) and alienation. He was gripped by the failure to acknowledge the subjective dimensions of ‘the idea of another society’ (Castoriadis 1987, 90). He arrived at the imaginary through reflections on both the limitations of Marxism and on how societies function:

The social world is, in every instance, constituted and articulated as a function of such a system of significations, and these significations exist, once they have been constituted, in the mode of what we called the *actual imaginary* (or the *imagined)*. … Every society up to now has attempted to give an answer to a few fundamental questions: The role of imaginary significations is to provide an answer to these questions, an answer that, obviously, neither ‘reality’, nor ‘rationality’ can provide (Castoriadis 1987, 146-7, original emphasis).

The social imaginary became for Castoriadis not only the register of the character of a specific society; it provided the basis for his ‘schemata’ for distinguishing societies.

Charles Taylor’s influential text *Modern Social Imaginaries* (2004) was, in part, a response to Castoriadis’s theorizing of the social imaginary. It emerged from an interdisciplinary collaboration convened by the Center for Transcultural Studies (CTS) and initiated in 1999 by a smaller group comprising Taylor, Benjamin Lee, Michael Warner and Dilip Parameshwar Gaonkar, which produced a position statement on ‘new imaginaries’[[4]](#endnote-5) and a special issue of *Public Culture*. This issue situated the project within a larger set of collective preoccupations about modernity, civil society and the public sphere.

Taylor’s (2002) essay is cited as providing the ‘conceptual frame’ (Gaonkar 2002, 10) for the special issue of *Public Culture*. This article also staked the terrain for Taylor’s (2004) subsequent book, addressing what the CTS group regarded as weaknesses in Castoriadis’s theorization of the social imaginary, as well as key global political developments of the early 21st century. In this essay Taylor (2002, 92) offered ‘an account of the forms of social imaginary that have underpinned the rise of Western modernity.’ Whereas Castoriadis had propounded a dualistic framework for characterizing social imaginaries, Taylor insisted that the Western social imaginary sustained a specific version of modernity. Taylor’s narrative traces the development of ‘the modern theory of moral order’ which later ‘infiltrates’ (Taylor 2002, 110) the Western social imaginary.

Taylor (2002, 108) reflected that ’the social imaginary’ is that ‘which enables us to carry out the collective practices that make up our social life’. Clarifying the distinction between social theory and the social imaginary, Taylor proposed that ‘the social imaginary is that common understanding that makes possible common practices and a widely shared sense of legitimacy’ ‘as the way we are able think or imagine the whole of society’ (Taylor 2004, 23, 69).

While considerations of scientific imaginaries may be more specific than those Taylor considered, he does offer perspectives relevant to STS. This includes his handling of charges that the concept of social imaginary ‘smacks’ of idealism. He insisted that this is ‘based on a false dichotomy’:

between ideas and material factors as rival causal agencies. In fact, what we see in human history is ranges of human practices that are both at once, that is, material practices carried out by human beings in space and time, and very often coercively maintained, and at the same time, self-conceptions, modes of understanding. These are often inseparable, in the way described in the discussion of social imaginaries, just because the self-understandings are the essential condition of the practice making the sense that it does to the participants (Taylor 2004, 31-2).

Arjun Appadurai was also an active member of the CTS and his *Modernity at Large* (1996) has proven to be a vital contribution to the conceptualisation of imaginaries. He declared: ‘the image, the imagined, the imaginary … are all terms that direct us to something critical and new in global cultural processes: *the imagination as a social practice’* (Appadurai 1996, 31). To understand this ‘new role for the imagination in social life’ he argues that it will be necessary to bring together:

the old idea of images, especially mechanically produced images (in the Frankfurt School sense); the idea of the imagined community (in Anderson’s sense) and the French idea of the imaginary (*imaginaire*) as a constructed landscape of collective aspirations, which is no more and no less real than the collective representations of Emile Durkheim, now mediated through the complex prism of modern media (Appadurai 1996, 31).

Appadurai does not provide a citation for *‘imaginaire’*: neither Sartre nor Lacan appear in his bibliography, while Castoriadis (1987) does. Whatever its lineages, the conceptual assemblage that Appadurai suggests explicitly articulates political philosophy with attention to images, mediation and electronic media, which is methodologically suggestive for investigating imaginaries. Extending Anderson’s ideas, Appadurai (1987, 33) addresses ‘*imagined worlds*, that is, the multiple worlds that are constituted by the historically situated imaginations of persons and groups spread around the globe’ and he suggests that the building blocks of these imagined worlds are ‘five dimensions of global cultural flows that can be termed (a) *ethnoscapes*, (b) *mediascapes*, (c) *technoscapes*, (d) *financescapes* and (e) *ideoscapes.*’

It is impossible to review the political philosophy which has influenced STS work on imaginaries without considering the return of the repressed -- the contribution of Louis Althusser. Although, as our conclusion will suggest, turns to the imaginary may be displacing the concept of ideology, Althusser’s work on ideological state apparatuses and his conceptualization of interpellation, remain influential in analyzing imaginaries (Warner 2000). Notably Althusser claimed that: ‘*Ideology represents the imaginary relationship of individuals to their real conditions of existence*’ (Althusser 1971, 109, original emphasis). Formulated in the shadow of Lacan’s account of subjectivity, he suggests a mechanism by which the relations of production are reproduced through institutions, rituals and practices. Moreover, given its implicit dependence on ideas of performativity, the concept of interpellation (hailing) can be mobilized to think about the ways in which imaginaries engage subjects (Haraway 1997).

Late twentieth-century political philosophy, as we highlight below, has provided important resources for STS of imaginaries. However, we have been struck by a relative lack of critical commentary about the adaptations and translations of this tradition into STS, prior to Jasanoff’s most recent work (Jasanoff 2015a). These brief commentaries on specific theories are intended to provoke more reflection on the relationship of STS research to this stream of political theory.

# *Science Fiction*

Donna Haraway’s work has been crucial to STS explorations of technoscientific imaginaries. Refusing reductive distinctions between science fiction (SF) and science fact, her creative engagement with and redeployment of SF has extended the resources for investigating the imaginaries of technoscience. Until fairly recently, there was scarcely any mention of science fiction (SF) in STS. However, on the margins of the field, SF’s speculative fiction mode has long been understood as a medium for diagnosing the history of the present.[[5]](#endnote-6) Furthermore, as will be discussed below, some feminist STS researchers (including Haraway) have been particularly sensitized to the visual aspects of imaginaries through their encounters with SF film and with key research in this domain. In this regard Vivian Sobchack (2001) has been an influential figure offering explorations of the imaginaries (without explicitly invoking this term) and the phenomenology of SF film and other related media. More generally, as Lisa Yaszek (2011, 385) observed: ‘SF enables authors to dramatize widespread cultural hopes and fears about new technoscientific formations as they emerge at specific historical moments.’

Yaszek is one of many feminist scholars inspired by Haraway’s lead. In her ‘Cyborg Manifesto’ (1985; 1991) Haraway hailed feminist SF writers as story-tellers who muse on what it means to live in and with modern technoscience. In *Primate Visions* (1989), SF is utilized forcefully in Haraway’s representation of the twentieth-century science of primatology:

science fiction has provided one of the lenses for reading primatological texts. Mixing, juxtaposing, and reversing reading conventions appropriate to each genre can yield fruitful ways of understanding the production of origin narratives in a society that privileges science and technology in its construction of what may count as nature and for regulating the traffic between what it identifies as nature and culture (Haraway 1989, 373).

Drawing on the tropes of SF, Haraway (1989, p.376) challenged her readers to consider how the core narratives of primatology might have been or could be different, by taking ‘the next logical step’ of moving ‘from reading primatology as science fiction’ to ‘reading science fiction as primatology.’

Haraway’s bringing together of STS and SF was radical, given the widespread neglect of science fiction by STS. Moreover, her experimentation with SF raised questions about the imaginaries of modern sciences and about alternative versions and visions of technosciences. Recently, in the wake of Haraway’s work, Sheila Jasanoff (2015b, 25; 2015a), a leading STS researcher on imaginaries, has explicitly acknowledged science fiction as ‘a repository of sociotechnical imaginaries.’

**Clusters of STS work with imaginaries**

In the preceding section, we have indicated some variety in the ways in which STS researchers have engaged with and related to the notion of imaginaries. In this section we provide a more comprehensive mapping of the main clusters of STS research around the concept, which we also track visually in figure 1.2. While there are different patterns that can be discerned in tracing such STS research, turning attention to notable methodological and theoretical orientations highlights diversity and clustering within the field. In what follows, we discuss exemplary contributions to STS under the following headings:

* anthropological
* national/institutional
* feminist

*Imaginaries in Anthropological STS*

STS use of the concept of imaginaries was launched in anthropological research, beginning with George Marcus’s edited collection *Technoscientific Imaginaries: Conversations, Profiles, and Memoirs* (1995b). Marcus (1995a, 3) explains that: ‘the term *imaginary* emerged effortlessly and just seemed to fit the topic’ of the volume which was, ‘an optimistic assemblage’ of studies of the conditions of work in science and technology at the end of the twentieth-century. Marcus (1995a, 4) assessed that the investigators contributing to the collection were primarily interested in ‘the imaginaries of scientists tied more closely to their current positionings, practices, and ambiguous locations in which the varied kinds of science they do are possible at all.’ This led him to reflect on the concept which informed their studies: ‘this is a socially and culturally embedded sense of the imaginary that indeed looks to the future and future possibility through technoscientific innovation but is equally constrained by the very present conditions of scientific work’ (Marcus 1995a, 4).

Marcus (1995a, 4) notes that, if future visioning figures in these conditions, it is a ‘cautiously imagined emergent future, filled with volatility, and uncertainty, but in which faith in practices of technoscience become even more complex and interestingly constructed.’ Hence, the collection revolves around technoscientific imaginaries that were perceived to derive from tensions between practices and discourses within the work of scientists. It is this gap which Marcus envisages his contributing authors and other STS researchers exploring, thereby generating ‘a completely transformed and vast field of inquiry on which a distinctly *cultural* studies of science might establish itself’ (Marcus 1995a, 7, original emphasis).

Joan Fujimura (2003) offers an example of how anthropological STS has focused on the crafting of future imaginaries as a constitutive part of the work of scientists. She considers the research of two leading Japanese scientists in the fields of genomics and computer science who she regards as having crafted two different imaginaries that link investment in innovative science and technology with discourses of cultural and religious distinctiveness. She uses the term ‘technosocial imaginaries’ since she regards them as conjuring both alternative futures for scientific practice and re-visioned versions of Japanese culture in the context of transnational economies in biology, genomics and computing.

Fujimura (2003, 192) cites Appadurai in insisting that the future imaginaries of these scientists are not ‘mere fantasy’ but are implicated in the formation and practices of scientific communities, involving ‘enterprises that have enrolled and engaged many people, funds, and government agencies, and much public and consumer interest.’ For her, imaginaries are enabling visions that involve persuasive rhetoric and possibly hyperbole, but which facilitate community formation and the marshalling of resources. Her emphasis on technosocial imaginaries as being implicated in national formations anticipates Jasanoff and Kim’s (2009) later comparative study of technoscientific imaginaries which is discussed below.

Anthropologists Kim and Mike Fortun (2005) also address notions of the imaginary in their research on the recent state of toxicology, advocating the idea of toxicology becoming a ‘civic science’ that would protect public health and not simply serve the interests of industry or the state. They suggest that anthropologists and other STS researchers could help in facilitating this vision. They argue that a study of imaginaries might– in the spirit of ‘friendship’ rather than criticism as is usually the case– help scientists negotiate change in their field, by enabling them to engage more fully with the social, ethical and legal implications of their practices. Referencing Marcus’s (1995a) discussion of ‘technoscientific imaginaries’, they propose the study of imaginaries as a way of looking at large-scale changes over time and at how these are understood locally. Moreover, they contend that, a focus on imaginaries may enable analysts to study the factors constitutive of subjectivity. They signal their interest in extending Sharon Traweek’s (1988) exploration of subject formations within and through scientific practices.

In contrast with anthropological studies of contemporary scientists, Karen-Sue Taussig (1997) deploys the concept in her situated study of pre-implantation genetic diagnosis (PGD) in the Netherlands. Taussig detects the operation of understandings of difference(s)—geographical, social and religious—in parental decision-making about this technology. Coining the term ‘geographical imaginary’ to characterize the way that ‘deeply embedded understandings of geographically specific social practices… play [out] in daily interactions that simultaneously produce people and their social worlds’ (Taussig 1997, 497), her exploration concerns the potential users of this technology, rather than scientists or doctors. Drawing on Edward Said’s study of *Orientalism* (1977), Taussig shows how such imaginaries, behaviors and identities are often ascribed to others in ways that serve the interest of the majority. Thus, Taussig uses the notion of imaginary to draw attention to the way that social and cultural conceptions of others are often aligned with geographical locality and gain widespread currency.

While Taussig’s ethnography pertains to a specific location, Helen Verran (1998) extends the use of the term imaginary in a comparative study of competing claims to land ownership. Triggered by legal disputes occurring towards the end of the twentieth-century between Cape York pastoralists and Australian Aboriginals over land rights and titles, Verran’s study juxtaposes the openness about the picturing, story-telling and the working-up of metaphors in the knowledge-making and negotiating practices of Aboriginal peoples in Australia with the denial of equivalent practices in Western knowledge practices around science. Observing the differences between the knowledge practices of these two cultures, Verran (1998, 238) comments:

Looking at some of their puzzles [faced by participants in negotiations over native title and pastoral leases] allows us to see an element almost entirely ignored by modern practices and accounts of knowledge. I call this element ‘the imaginary’ and point to its necessary involvement in knowing and knowledge making. I show the imaginary as something constitutive of, and constituted by, ontic and epistemic commitments.

Verran (1998, 243) holds out the challenge of acknowledging and addressing the imaginaries in Western science and knowledge production that have generally been denied or obscured because, as she sees it: ‘Modernity circumscribes its imaginary as of aesthetic, but not ontic or epistemic interest.’ She states that: ‘by restoring imaginaries to modern theories of knowledge, we [Westerners] will rediscover the capacity to re-imagine ourselves, and devise ways they can work with other communities—human and non-human’ (Verran 1998,249). So imaginaries are not only about possible futures involving visions and speculation, but about knowledge production itself, and commitments to certain forms of reality.

Verran’s take on imaginaries is linked to her reading of Kant through feminist philosopher Michèle Le Doeuff. Le Doeuff (1980; 1989) argues that Kant regarded the exclusion of the imaginary as the defining property of reason, but that he could only represent this exclusion through the use of imagery and extended metaphors (picturing and storytelling). Moreover, imaginaries are very much associated with practices, not minds, for Verran. It is in the everyday messing with mucky, obdurate stuff, and in conversations and texts that imaginaries are enacted and enact. Hence, imaginaries interpellate objects/subjects that/who are implicated in and by the practices, thereby constituting them as objects/subjects (Verran 1989, 252). Verran insists that imaginaries must be acknowledged and recognized with their operations in what she calls a ‘logic’ in performative modes of knowledge production.

The preceding review provides a sample of the range and diversity of recent anthropological studies of technoscience which have employed the concept of imaginaries. It is perhaps not surprising to find anthropologists, sharing a common ethnographic method[[6]](#endnote-7) and working within a discipline traditionally concerned with culture, engaging in the study of imaginaries. Nevertheless, these studies vary, with much anthropological STS focused on particular scientists, scientific communities or specific technoscientific sites (e.g. laboratories or clinics), while some investigate the imaginaries of non-professionals (such as Taussig’s case of parents using PGD testing) or, in Verran’s, offering a comparative analysis of Western scientific and Australian aboriginal knowledge systems. For some of these scholars, researching imaginaries becomes something more than a theoretical or methodological pivot for their own research. In fact, they recommend it as a potential reorienting tool for STS more generally. We will return to this in our conclusion.

*National and institutional imaginaries*

A second strand of STS research has drawn heavily on political theory in its use of the concept of imaginaries. Oriented towards analyzing and characterizing the policies and practices of states and large institutions, this work has generally not relied on ethnographic modes. One of the most cited examples of such research is Jasanoff and Kim’s (2009) comparative study of US and South Korean orientations towards civil nuclear power technology. Jasanoff and Kim advocated the use of the notion of ‘sociotechnical imaginaries’ as a way of encouraging STS research on national and state technoscientific policies and politics. This has proven to be a generative line of inquiry (Jasanoff and Kim 2013; Kim 2013; Mikami 2014; Jasanoff and Kim 2015). Across this body of work, Anderson’s study of the origins of national ‘imagined communities’ (1983), as well as Castoriadis’s (1987) and Taylor’s (2007) studies of modern political formations constructed in and through ‘social imaginaries’ have been vital reference points.

Jasanoff and Kim (2009) contend that the relationship between science and technology and political institutions has been relatively neglected by STS. They pose the question: ‘How do national science and technology projects encode and reinforce particular conceptions of what a nation stands for?’ (Jasanoff and Kim 2009, 120). Setting out to explore how national political orders and technoscientific projects co-produce each other, they offer a definition of national sociotechnical imaginaries as: ‘collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and or technological projects’ (Jasanoff and Kim 2009, 120). They add that such imaginaries ‘at once describe attainable futures and prescribe futures that states believe ought to be obtained’ and that they operate ‘in the understudied regions between imagination and action, between discourse and decision, and between inchoate public opinion and instrumental state policy’ (Jasanoff and Kim 2009, 120, 123). Jasanoff and Kim (2009, 123) argue that, despite globalization, sociotechnical imaginaries are intertwined with the production and reproduction of nations, insisting that the national is not simply given or immutable, but continuously ‘reimagined, or re-performed, in the projection, production, implementation, and uptake of sociotechnical imaginaries.’

Jasanoff and Kim draw extensively on political philosophy in framing their study. They also discuss a cluster of STS work which they regard as either implicitly or explicitly sharing their interest in sociotechnical imaginaries. They demarcate between STS and histories of science and technology claiming the latter field tends to regard the imagination as an individualised mental capacity (Jasanoff and Kim 2009, 122).[[7]](#endnote-8) They distinguish between their coinage—‘sociotechnical imaginaries’-- and Marcus’s term -- ‘technoscientific imaginaries’ -- on grounds that imaginaries of technoscience pertain to ‘the social world writ large’ [and not just scientists] since ‘”social imaginaries,” encode collective visions of the good society’ (Jasanoff and Kim 2009, 123). They clarify the conceptual scope of imaginary by contrasting it with other concepts used in exploring the cultural, social or political dimensions of technoscience, such as ‘policy agendas’, ‘master narratives’, or ‘media packages’ around ‘discursive frames’. They note that, while they project hopes and promises, imaginaries may also project fears and risks around innovation.

Jasanoff and Kim (2009, 123) explain that, ‘sociotechnical imaginaries as we define them are associated with active exercises of state power’ and, that while multiple discursive framings may circulate in any society, some become filtered and selected, emerging as dominant, embedded in the goals and priorities of state and public action. Koichi Makimi (2014) takes up this observation in his case-study of regenerative medicine research in Japan. He argues that the state’s early material commitments to certain technologies, with reference to its visions for the nation’s future, can lead to certain imaginaries becoming ‘locked-in’.

Elta Smith (2009) applies Jasanoff and Kim’s notion of the ‘sociotechnical imaginary’ in her study of the Rockefeller Foundation as an actor that is beyond any national or state-bounded political sphere. Smith investigates the Rockefeller Foundation’s fifty-year funding of rice research and uses ‘the term *imaginaries* to characterize the Foundation’s conceptions of “development” and its changing role in rice experimentation over time’ (Smith 2009, 462 original emphasis). She contends that there are ‘always multiple imaginaries at play in a society and within institutions’ and she explains that her study explores how ‘particular imaginaries’ emerged and prevailed through the Rockefeller Foundation so as to become the ‘best, most appropriate, or even inevitable—and how they became hegemonic while seeming apolitical or value-neutral’ (Smith 2009, 462). Smith (2009, 479) concludes by noting how ‘imaginaries of development have history and politics’, observing that the ‘the imaginaries projected and actualized by the Rockefeller Foundation’ have altered in relation to changing political imperatives and rationalities.

For Smith (2009, 462), an imaginary is a ‘particular, often complex view of the world that comes to shape agendas, research trajectories, projects, and policies’, noting here the work of Taylor (2004) and Anderson (1983). She uses the term to denote ‘normatively loaded visions not only of what should be done “in the world” but also how it should be undertaken and why’ (Smith 2009, 462), adding that ‘imaginary also refers to a larger constellation of ideologies, and social factors that enables or constrains discourse in certain ways’, quoting Appadurai’s (1996) evaluation that it is an ‘organized field of social practices’ (Smith 2009, 462). Smith (2009, 463) explains that: ‘the imaginaries concept suggests that the world has been consequentially envisioned in certain ways, at certain moments in time, by actors who have the capacity to materialize these abstractions.’

Other researchers have deployed the concept of the imaginary in this socio-political and institutional thread of STS work to consider how publics are positioned in various kinds of technoscientific projects. For example, Neil Stephens, Paul Atkinson and Peter Glasner (2013) adapt Jasanoff and Kim’s approach, shifting the focus away from the state to other institutional actors and considering how they conjure assumptions about their publics, which they call enacting ‘institutional imaginaries of publics’. Ian Welsh and Brian Wynne (2013) are also concerned with imaginaries of publics in the UK context. While they refer to the term technoscientific imaginary, their primary reference is Charles Taylor’s concept of the ‘social imaginary’. In turn, their work has influenced Claire Marris’s (2014) discussion of how many synthetic biologists imagine publics as a threat to their visions of the future and Stevienna de Saille’s (2014) related research on ‘unruly publics’. David Hess also cites Welsh and Wynne (2013), but goes on to consider how the imaginary resonates with a range of other concepts in anthropology and sociology, including cultural logics, cultural code, discourse, ideology and frame (Hess 2014, 76). He suggests that the use of the concept of imaginary fits well with Clifford Geertz’s call for an ‘interpretative science that attends to webs of meaning’ (Hess 2014, 76). While Jasanoff and Kim (2009), and Smith (2009) also acknowledge multiple imaginaries, they conclude that over time certain imaginaries prevail. Hess, however, stresses the importance of paying greater attention to times of contestation and to the social positions and power of actors who articulate ‘counter-imaginaries’.

The stream of research focused on national imaginaries of science and technology has predominantly been either explicitly or implicitly comparative (Jasanoff 2015b). Its analytical gaze has not been restricted to Europe and/or the West (for example, see Jasanoff and Kim 2009). However, one of the more challenging deployments of imaginaries proposes movement beyond ‘the Western versus non-Western technological divide’ and ‘relativistic comparisons across nations’ towards accounts of the ‘hierarchically entangled histories of technoscience practices’ (Prasad 2014, 7). Combining empirical and deconstructivist methods and drawing on ethnographic research, Prasad examines the relational and hierarchical imaginaries that have emerged around MRI technology in the USA, Britain and India.

Compared to the anthropological orientation discussed above, this thread of work on national and institutional imaginaries is distinguished by its foregrounding of issues of governance, and, to some extent, policy. Methodologically, much of the research in this mode has been realized through textual analysis (of various sorts) and there has often been an historical and comparative (Jasanoff 2015a) dimension to these investigations. Once again, we have identified a reformist agenda emerging here: particularly with Jasanoff and Kim’s recommendations for more attention to state policies on technoscience and national comparisons in STS research. Some researchers (Smith 2009) and, most notably Jasanoff and Kim (2015a) themselves, have subsequently extended their focus to include the study of other institutions and publics in explorations of technoscientific imaginaries. In addition, through ethnographic research and deconstructive methods, Prasad (2014) has raised critical questions about the reproduction of binaries and the neglect of hierarchies in the study of technoscience practices.

*Feminist STS imaginaries*

Since the close of the twentieth century, some feminist STS scholars have worked intensely with the notion of imaginaries. In using the concept some of them have mobilized and adapted LeDoueff’s explorations of ‘the philosophical imaginary’ (Verran 1998; Waldby 2000; Squier 2004).

However, it is important to situate the deployment of the concept within a wider feminist STS context. This brings us back again to Haraway a crucial figure beckoning her readers to decipher the imaginative dimensions of technoscience. Perhaps more than any other researcher, she has dispersed the STS gaze, demonstrating the need to investigate the makings and re-makings of science and technology in a range of diverse sites, drawing attention to locations that would previously have been regarded as ephemera in relation to modern science (e.g. cinema, advertising, etc.).

Haraway’s foregrounding of story-telling as a key mode of modern science has been another important vehicle for her exploration of the imaginaries of technoscience, marking a significant shift in STS practice. *Primate Visions* detected and examined the strands of story-telling that were woven into the twentieth-century science of primatology. Moreover, as outlined above, a further reflexive spin was added through Haraway’s use of SF to raise questions about her own story-telling about the making of this science and to encourage her readers to conjure alternative stories about it.

Haraway’s attention to the imagery of modern technoscience is another crucial mode in her explorations of the imaginaries of science. In *Modest Witness* (1997), for example,she provides a reading of a set of visual texts (advertisements and cartoons) which represented modern genetics during the period of the Human Genome Project. This is accompanied by an examination of the trope of mapping– which was crucial to the Human Genome Project. In this chapter, Haraway considers the making and interpellation of ‘technoscientific subjects’ (Haraway 1997, 172) through the imaginary of genomics, during the completion of the Human Genome Project. She shows that interpellation works through the mobilizing of a repertoire of cultural resources and references (e.g. high art, Christian iconography), involving complex psycho-social processes, including investment and attachment. Humour emerges as an important vehicle in such interpellation, indicating that engagement with scientific imaginaries is not exclusively cognitive.

Haraway discerns a ‘technoscientific unconscious’ in operation in ‘the processes of formation of the technoscientific subject’ and she sets out to identify the ‘structures of pleasure and anxiety’ (Haraway 1997, 151) contributing to the formation and reproduction of this subject, thereby effectively demonstrating that technoscience is not exclusively the domain of the rational. Her accounts highlight various moments in the continuous making and re-making of technsocience in diverse, often mundane, but complex processes which she sees as enabling the formation of technoscientific subjects, involving pleasure, anxiety and other emotions. Narrative and figuration are presented as the modes through which the technoscientific unconscious operates that can be traced through a multitude of media. Haraway maintains that we are interpellated by these processes: constituted as technoscientific subjects through diverse practices and encounters. Moreover, she insists that STS analysts are themselves not exempt from such interpellation.

Having foregrounded Haraway’s significance in STS research on the imaginary, we now turn to the work of other feminist scholars, beginning with Catherine Waldby’s examination of the ‘biomedical imagination’ and ‘biomedical imaginary’. Waldby provides a detailed explication of Le Doeuff’s (1989) notion of ‘philosophical imaginary’. Bringing this together with Derrida’s discussion of metaphor, Waldby (1996, 29) considers figurations in science, insisting on ‘the absolute indissociability of figure from technical language, the impossibility of controlling its connotative force, the irreducible operation of the metaphor in scientific textual practice.’ She introduces her own term—‘biomedical imagination’ – ‘to emphasize the speculative, “fictional” dimensions of the medical enterprise’ (Waldy 1996, 5, 16).

Waldby’s (2000) major study of the Visible Human Project uses the term *imaginary.* Taking her cue from Le Doueff, she registers the importance of imagery as a marker of points of tension in a system of logic or knowledge – in this case—biomedical knowledge. She explains that:

The biomedical imaginary refers to the speculative, propositional fabric of medical thought, the generally disavowed dream work performed by medical theory and innovation. It is a kind of speculative thought which supplements the more strictly systematic, properly scientific thought of medicine, its deductive strategies and empirical epistemologies (Waldby 2000, 136).

Hence, Waldby also follows Le Doueff in associating the imaginary with the excessive – that which ‘supplements’ the bare bones of logic. Accordingly, she notes that the imaginary includes fantasy, myth, etc. Despite her explicit discussion of ‘biomedical imaginary’, Waldby continues to use the term ‘biomedical imagination’ at various points, as if the terms were interchangeable. Moreover, she posits that the need for legitimizing technoscience in the contemporary era might make the maintenance of canonical scientific meanings more difficult to enforce.

While Waldby’s explorations have been biomedical, there has also been a discernible cluster of feminist STS research analysing the imaginary of modern genetics and genomics. A relatively early investigation was José van Dijck’s *Imagenation: Popular Images of Genetics* which examined ‘the role of images and imagination in popular representations of the new genetics since the late 1950s’ (van Dijck 1998, 3) and coined the term ‘imagenation’. Adapting Katherine Hayles’s characterisation of science as a ‘theatre of representation’ (3), van Dijck (1998, 3) offers pictures of the four stages of ‘imagenation’ which she considered constituted the phases of popular imagery associated with new human genetics from the 1950s to the 1990s and the Human Genome Project. Van Dijck deciphered specific popular images, but her analysis concerns ‘imagenations’ which range from ‘biofears’ and ‘biofantasies’, to notions of the gene as ‘master controller’ (van Dijck 1998, 91).

Following van Dijck’s project, Sarah Franklin (2000) and Jackie Stacy both offer different versions of what they call the ‘genetic imaginary’ (see also Steinberg 2015).[[8]](#endnote-9) Franklin provides a case-study of the popular Hollywood film -- *Jurassic Park* (1993) -- and of its cultural off-shoots. She unpacks the many layers of the film’s representation of ‘life itself’ and indicates its cultural reverberations – not just in a plethora of tie-in products, but in high-cultural manifestations, including an exhibition at the American Natural History Museum in New York. Franklin undertakes an examination of how the cultural phenomena of *Jurassic Park* instantiate the new genetic imaginary associated with late-twentieth century genomics. Introducing her terminology, she explains:

If part of the way life itself, as a discursive condition, or as historical epistemology, calibrates its syntax is at the level of politics, truth or liberation, another level of this syntax can be defined as an *imaginary*. Not in the technical sense of a psychoanalytic pre-symbolic realm of undifferentiated toti-potency, but in the more quotidian sense of a realm of imagining the future, and re-imagining the borders of the real, life itself is dense with the possibility of both salvation and catastrophe (Franklin 2000, 198).

One crucial feature of Franklin’s perception of the ‘genetic imaginary’ is that it involves the breaking-down of hitherto crucial established distinctions: ‘in its blend of sober scientific prediction, speculative commercial ventures, virtual cinematic effects and popular narrative forms, *Jurassic Park* is a film which collapses distinctions between fact and fiction, life and art, science and entertainment’ (Franklin 2000, 215). Franklin (2000, 216) highlights the ‘public witnessing’ of the making and re-making of life as it is being ‘manufactured and marketed’ in and through the new practices of the genomic biosciences, epitomized by the media attention given to the cloning of Dolly the Sheep. She proposes that: ‘in tracing the work of the genetic imaginary…an essential critical dimension can be added to the analysis of global culture, global nature’ (Franklin 2000, 224). Her argument and her deployment of the concept of ‘genetic imaginaries’ is, ‘concerned not only with how we imagine genes, genetics or genealogy, but with a much wider set of orienting devices through which the world is both imagined and reproduced’ (Franklin 2000, 222). Hence, Franklin regards ‘genetic imaginaries’ as a critical tool which could generate awareness of shifts in key social/political categories and orientations realized in and through technoscientific change.

Jackie Stacey’s *The Cinematic Life of the Gene* (2010) is also centrally concerned with the genetic imaginary. The book offers an exploration of ‘the changing relationship between biological and cultural forms at the current conjuncture of science, feminism, and the cinema’ (Stacey 2010, x) and consists of a collection of readings of cultural theories and six films, released between 1995 and 2005, which revolve around genomics and cloning. Offering her own definition of the genetic imaginary, she relates it to the contemporary era:

I define the genetic imaginary as the mise-en-scène of those anxieties [concerning the reconfiguration of the boundaries of the human body, the transferability of its informational components, and the imitative potentialities of geneticized modes of embodiment], a fantasy landscape inhabited by artificial bodies that disturb the conventional teleologies of gender, reproduction, racialization, and heterosexual kinship (Stacey 2010, 8).

Stacey both acknowledges the genealogical resources informing her use of the term and distinguishes her own from other deployments. She registers, in particular, Haraway’s (1997) use of notions of the ‘gene fetish’ and the ‘genetic unconscious’ as in tune with her own psychoanalytic take on the genetic imaginary. Stacey is more explicit than any other researcher we have discussed about her psychoanalytically informed uses of imaginary. She distinguishes clearly what she calls ‘the philosophical/aesthetic’ tradition from her favoured psychoanalytic version of the concept.[[9]](#endnote-10)

There are commonalities and differences in the feminist STS research reviewed above. For example, these scholars all register that images and imagery are highly significant in all instantiations of technoscience. They regard such material not as extraneous or merely illustrative, but as integral to technoscience, thus meriting STS attention. Feminist STS researchers have been particularly concerned with the visual forms and aspects of imaginaries. However, some are more concerned than others to use imaginaries in investigating subjectivity and subject formation. Feminist researchers investigating imaginaries have explored diverse cultural forms, as well as the fantasies, hopes and fears engendered by recent technoscience, particularly by the life sciences including genomics. To date, however, in comparison with other approaches discussed in this chapter, feminist work around imaginaries has garnered limited attention.

**Conclusion**

To conclude we now consider what might be at stake in STS investigation of imaginaries. The preceding review has shown that the pursuit of imaginaries is often presented as a vehicle for re-orientations of STS. For example, Marcus (1995a, 3) regarded the notion of imaginaries as a vehicle for moving towards ‘distinctly cultural study of science’—encouraging explorations of the tensions between scientific discourses and practices. Jasanoff and Kim (2009) called for STS to cast its investigative gaze beyond professional scientific actors and communities to analyze national cultures of technoscience, facilitated by their notion of *sociotechnical imaginaries*. More recently, Jasanoff (2015a, 5) has contended that such imaginaries are ‘not limited to nation states but can [also] be articulated by other organized groups, such as corporations, social movements, and professional societies’. The concept has sometimes become the lynchpin for researchers’ ambitions for STS. Fujimura (2003) advocated the use of ‘imaginaries’ in forging ‘sociologies of the future’. Invoking imaginaries, Fortun and Fortun (2005) had aspirations for a new ‘civic science’ of toxicology and an STS ‘ethics and friendship with the sciences’.

Recent research on imaginaries has also been part of a more general shift within the field. STS’s earlier preoccupations with logic and epistemology have been supplemented, or, indeed, replaced with a much broader agenda which includes research on aesthetics, values, and emotions. So, for example, the sociology of expectations (Borup, Brown, Konrad, and van Lente 2006; van Lente 2003) and concern with hope, promise and hype (Michael 2000; Wyatt 2000; Brown 2003; Hedgecoe and Martin 2003; Hedgecoe and Martin 2008; Pollock and Williams 2010) have opened STS to the study of social and psychological investments and future visions linked to specific technoscientific developments.[[10]](#endnote-11) Moreover, whereas science and technology were formerly generally regarded as the domains of facts and artifacts, they are now as likely to be associated with storytelling, imaging, and imagining and, even, hyping.

Beyond strategic, ethical and methodological reorientations of the field, imaginaries are identified with normative aspects of technoscience. In this regard, STS has been transformed by feminist and postcolonial scholarship. In challenging assumptions about science as a value-neutral domain and demonstrating how modern Western science has been implicated in gendered and post-colonial power relations, these movements have opened the field to studies of imaginaries (see esp. Prasad 2014). Imaginaries research also seems to bring a new humanist inflection to STS – concerned as it is with human vision, values, aesthetics, and power. Indeed, Jasanoff characterizes imaginaries research as ‘a profoundly humanistic inquiry’ (Jasanoff 2015b, 3), as a reaction against ‘the flatness of networks’ (Jasanoff 2015a, 21). More generally, engagement with imaginaries may also constitute a critical response to some exclusively materialist dispositions within STS, opening the field to investigations of psycho-social and related perspectives on science and technology.

The concept of imaginaries also registers a more specific theoretical shift. Until recently, discussions of values within technoscience were generally handled through notions of ‘interests’ and/or ‘ideologies’. These have proven to be limited theoretical tools for pursuing the normative dimensions of science. These terms operate primarily in a cognitive register – neglecting affective dimensions (which have been a prime concern of social research in recent years). Moreover, both concepts are linked to distortion, misrepresentation, and manipulation, whereas invoking the imaginary allows for consideration of the productive, of expectations, dreams and the unconscious and it is these dimensions of technoscience and medicine which are increasingly attracting attention.

From this perspective, the circulation of the concept of imaginaries marks the relative decline in the deployment of the notion of ideology in STS research.[[11]](#endnote-12) Taylor (2004, 183) has noted that, while the concept of social imaginary could designate elements traditionally associated with ‘distorted or false consciousness’– which he associates with ideology, it may also entail ‘what we imagine can be something new, constructive, opening new possibilities.’ Haraway (2000, 77-78) has also cautioned that there is a need for precision in the use of the term ‘ideology’: ‘And we must remember the mythological and the ideological are not the same thing. It is important to keep the fantastic, the mythological and the ideological as three different registers of an imaginary relationship.’ As Haraway’s comment suggests and, as much recent cultural studies theory attests, analysts have been pushing beyond representations towards much more complex accounts of meaning making and affect generation.

However, what might seem *de rigeur* in cultural studies may be more problematic in STS. In this regard it is helpful to return to Verran’s (1998), Waldby’s (2000), and Squier’s (2004) assessments that the denial of imaginaries has been a crucial feature of Western science and to assumptions about there being clear demarcations between fact and fiction or fantasy that may still linger within STS. STS’s uneasy relationship to SF is an obvious manifestation of this. Moreover, we have also noted that Haraway presents some of her research as probing the difficult territory she designates as the ‘unconscious’ of genomic science.

Acknowledging these tensions around STS brings us to questions about methods for analyzing the imaginaries of technoscience. Jasanoff and Kim have emphasized the importance of comparative methods (Jasanoff 2015a) in STS research on imaginaries. However, Prasad (2014: 6) has warned that some comparative STS research reproduces, rather than challenges, ‘the West versus non-West technocultural divide’. As noted previously, he opts instead for a focus on ‘hierarchically entangled histories of technoscientific practices.’ More generally, there has not been much detailed investigation of how imaginaries actually work. It is clear that undertaking such research may require new ways of exploring the performativity of imaginaries. Moreover, given that imaginaries are far-reaching social phenomena, it may take something other than the conventional techniques of exposition and argument to conjure their features. Thus, it is not surprising that Haraway experiments with the form of her texts: dabbling with humour, shock, as well as playing with SF.

Returning to the genealogy of the concept of imaginaries we can see that, with the exception of some feminist research, STS has been much more open to the traditions of political theory than to psychoanalysis and SF as resources for the investigation of scientific imaginaries. Imaginaries have often been neatly packaged in STS work: national socio-technical imaginaries, imaginaries of publics, etc. In a recent keynote address, Steven Shapin (2011) declared subjectivity as the new challenge for STS. Shapin’s failure to acknowledge recent feminist STS contributions on this topic was controversial. However, there may be unease about bringing subjectivity and fantasy into STS research. STS engagement with the concept of imaginaries may provide an avenue onto that terrain. If this is to occur, there may need to be more awareness of and recourse to the diverse repertoires through which the concept has emerged.

Finally, we must return briefly to interdisciplinarity and to the breadth and scope of STS as these figure in recent deployments of the concept of imaginaries. The range and diversity of STS scholarship which pivots on notions of imaginaries is impressive. Our investigation has triggered questions about what counts as STS, and generated a sense of the many flowers blooming in this rich field. Our concern has been to broaden awareness of this complex development and to encourage further experimentation in STS investigations of imaginaries.

1. Gaonkar (2001, 1) offers another definition: ‘an enabling but not fully explicable symbolic matrix within which people imagine and act as world making collective agents’. In contrast with Waldby, Gaonkar does not highlight tensions between imaginaries and logic or rationality. [↑](#endnote-ref-2)
2. See Latour and Woolgar’s (1979; 1989) deletion of ‘Social’ from the original title of *Laboratory Life*. [↑](#endnote-ref-3)
3. Jasanoff (2015a, 11) is critical of Anderson, as well as Taylor and Appadurai, for neglecting science and technology in their accounts of modernity. Nevertheless, Anderson and Appadurai do acknowledge the importance of printing and communication technologies and Anderson has integrated science and technology in the later editions of his book, including maps, census and the museum as technologies. [↑](#endnote-ref-4)
4. This position statement presented ‘five key ideas’ associated with the concept: ‘social imaginaries were ways of understanding the social that become social entities themselves and mediate collective life’; ‘modernity has multiple forms that rely on forms of social imaginary based on relations amongst strangers and ... stranger sociability was made possible through mass mediation’; ‘the national people is a paradigmatic case of modern social imaginary’; ‘a national people lives amid many other social imaginaries’; ‘the agency of modern social imaginaries comes into being in a number of secular temporalities’ (Gaonkar 2002, 5). [↑](#endnote-ref-5)
5. Nevertheless, there are other links between STS and SF that could be traced but which are beyond the remit of this article. For example, before establishing his reputation as a SF novelist, the British author Brian Stableford produced an STS PhD thesis on the Sociology of Science Fiction. [↑](#endnote-ref-6)
6. Hyysalo (2006) also uses ethnography within a symbolic-interactionist framework to analyze practice-based imaginaries in design. [↑](#endnote-ref-7)
7. Although not included in our study, Kay’s (2000) history of the emergence of molecular biology as an informational technoscience uses, but does not directly discuss, the term imaginaries and is a counter example to this assessment. [↑](#endnote-ref-8)
8. For other versions of the genetic imaginary, following Franklin see Gerlach (2004); Blaagard (2009); and Steinberg’s (2015) related study of the bioimaginary. [↑](#endnote-ref-9)
9. The former is particularly evident in Waldby’s (1996; 2000) and Verran’s (1998) studies. Nevertheless, Le Doueff (1985) and Waldby certainly draw on the psychoanalytical tradition in formulating their takes on imaginaries. [↑](#endnote-ref-10)
10. There are obvious connections between the sociology of expectations and the conceptualization of imaginaries in STS. However, the disciplinary specificity, the focus on particular technoscientific developments, and on orientations towards the future distinguish the former from the explorations of imaginaries considered in this chapter. [↑](#endnote-ref-11)
11. Nevertheless, some STS researchers (as noted above) do use the concept together with the notion of imaginaries.

    **REFERENCES**

    Althusser, Louis. "Ideology and Ideological State Apparatuses." In *Lenin and Philosophy and Other Essays*, edited by Louis Althusser. London: Verso, 1971.

    Anderson, Benedict. *Imagined Communities:  Reflections on the Origin and Spread of Nationalism*. London and New York: Verso, 1983.

    Blaagard, Bolette .B. "The Flipside of My Passport: Myths of Origin and Genealogy of White Supremacy in the Mediated Genetic Imaginary." In *Complying with Colonialism:  Gender, Race and Ethnicity in the Nordic Region*, edited by S. Keskinen, S. Tuori and D. Mulinari. Farnham: Ashgate, 2009.

    Borup, Mads, Nik Brown, Kornelia Konrad, and Harro Van Lente. "The Sociology of Expectations in Science and Technology Analysis." *Technology Analysis and Strategic Management* 18, no. 3/4 (2006): 285-98.

    Brown, Nik. "Hope against Hype: Accountability in Biopasts, Presents, and Futures." *Science Studies* 16, no. 2 (2003): 3-21.

    Brown, Nik, and Mike Michael. "A Sociology of Expectations: Retrospecting Prospects and Prospecting Retrospects." *Technology Analysis and Strategic Management* 15, no. 1 (2003): 3-18.

    Castañeda, Claudia, and Lucy Suchman. "Robot Visions." *Social Studies of Science* 44, no. 3 (2014): 315-41.

    Castoriadis, Cornelius. *The Imaginary Institution of Society*. Translated by Kathleen Blamey. Cambridge, Mass.: MIT Press, 1987.

    Cutting, Andrew. "Ashes in Orbit: Celestis Spaceflights and the Invention of Post-Cremationist Afterlives." *Science as Culture* 18, no. 3 (2009): 355-69.

    De Saille, Stevienna. "Dis-Inviting the Unruly Public." *Science as Culture* 24, no. 1 (2014): 99-107.

    Fortun, Kim, and Mike Fortun. "Scientific Imaginaries and Ethical Plateaus in Contemporary Us Toxicology." *American Anthropologist* 107, no. 1 (2005): 43-54.

    Franklin, Sarah. "Life Itself: Global Nature and the Genetic Imaginary." In *Global Nature, Global Culture*, edited by Sarah Franklin, Celia Lury and Jackie Stacey. London and New York: Routledge, 2000.

    Fujimura, Joan. "Future Imaginaries: Genome Scientists as Sociological Entrepreneurs." In *Genetic Nature/Culture: Anthropology and Science Beyond the Two-Culture Divide*, edited by A.H. Goodman, Heath, D. and Lindee, M.S. Berkeley, CA.: University of California Press, 2003.

    Gaonkar, Dilip Parameshwar. "Toward New Imaginaries: An Introduction." *Public Culture* 14, no. 1 (2002): 1-19.

    Geissler, P. Wenzel, and Ruth J. Prince. "Active Compounds and Atoms of Society: Plants, Bodies, Minds and Cultures in the Work of Kenyan Ethnobotanical Knowledge." *Social Studies of Science* 39, no. 4 (2009): 599-634.

    Gerlach, Neil. *The Genetic Imaginary:  DNA in the Canadian Justice System*. Toronto: University of Toronto Press, 2004.

    Good, Mary-Jo DelVecchio. "The Medical Imaginary and the Biotechnical Embrace: Subjective Experiences of Clinical Scientists and Patients." In *A Reader in Medical Anthropology: Theoretical Trajectories, Emergent Realities*, edited by Michael M.J. Fi Byron J. Good. Oxford: Wiley-Blackwell, 2010.

    Haraway, Donna. "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century." In *Simians, Cyborgs and Women:  The Reinvention of Nature*, edited by Donna Haraway. London: Free Association Books, 1991.

    ———. *How Like a Leaf: An Interview with Thryza Nichols Goodeve*. London and New York: Routledge, 2000.

    ———. "Modest\_Witness@Second\_Millennium.Femaleman©\_Meets\_Oncomouse™: Feminism and Technoscience." London and New York: Routledge, 1997.

    ———. *Primate Visions: Gender, Race and Nature in the World of Modern Science*. London and New York: Routledge, 1989.

    Harvard University. "STS Research Platform:  Sociotechnical Imaginaries." <http://harvard.edu/research/platforms/imaginaries.>

    Hedgecoe, Adam, and Paul Martin. "Genomics, STS, and the Making of Sociotechnical Futures." In *Handbook of Science and Technology Studies, 3rd Edn*, edited by Edward J. Hackett, Olga Amsterdamska, Michael Lynch and Judy Wajcman. Cambridge, Mass and London: MIT Press, 2008.

    ———. "The Drugs Didn't Work: Expectations and the Shaping of Pharmacogenetics." *Social Studies of Science* 33, no. 3 (2003): 327-64.

    Hess, David J. "Publics as Threats? Integrating Science and Technology Studies and Social Movement Studies." *Science as Culture* 24, no. 1 (2014): 69-82.

    Jasanoff, Sheila. "Future Imperfect: Science, Technology and the Imaginations of Modernity." In *Dreamscapes of Modernity:  Sociological Imaginaries and the Fabrications of Power*, edited by Sheila Jasanoff and Sang-Hyun Kim. Chicago: University of Chicago Press, 2015.

    ———. "Imagined and Invented Worlds." In *Dreamscapes of Modernity:  Sociological Imaginaries and the Fabrications of Power*, edited by Sheila Jasanoff and Sang-Hyun Kim. Chicago: University of Chicago, 2015.

    Jasanoff, Sheila, and Sang-Hyun Kim. "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea." *Minerva* 47, no. 2 (2009): 119-46.

    ———. "Sociotechnical Imaginaries and National Energy Policies." *Science as Culture* 22, no. 2 (2013): 189-96.

    Kay, Lily E. *Who Wrote the Book of Life? A History of the Genetic Code*. Stanford: Stanford University Press, 2000.

    Kim, Sang-Hyun. "The Politics of Human Embryonic Stem Cell Research in South Korea: Contesting National Sociotechnical Imaginaries." *Science as Culture* 23, no. 3 (2013): 293-319.

    Koch, Gertraud, Estrid Sørensen, and Les Levidow. "Childish Science: Editorial Introduction." *Science as Culture* 20, no. 4 (2011): 421-31.

    LeDoeuff , Michele. *The Philosophical Imaginary*. Translated by Colin Gordon. Stanford: Stanford University Press, 1985.

    Marcus, George. "Introduction." In *Technoscientific Imaginaries*, edited by George Marcus. Chicago: University of Chicago Press, 1995.

    ———, ed. *Technoscientific Imaginaries: Conversations, Profiles and Memoirs*. Chicago: University of Chicago Press, 1995.

    Marris, Claire. "The Construction of Imaginaries of the Public as a Threat to Synthetic Biology." *Science as Culture* 24, no. 1 (2014): 83-98.

    Mikami, Koichi. "State-Supported Science and Imaginary Lock-In: The Case of Regenerative Medicine in Japan." *Science as Culture* (2014): 1-22.

    Nerlich, Brigitte, and Carol Morris. "Imagining Imaginaries." 2015.

    Olarte Sierra, María Fernanda, and Adriana Díaz Del Castillo Hernández. "‘We Are All the Same, We All Are Mestizos’: Imagined Populations and Nations in Genetics Research in Colombia." *Science as Culture* 23, no. 2 (2013): 226-52.

    *Oxford English Dictiona*ry (2009).

    Pollock, Neil, and Robin Williams. "The Business of Expectations: How Promissory Organisations Shape Technology and Innovation." *Social Studies of Science* 40, no. 4 (2010): 525-48.

    Prasad, Amit. *Imperial Technoscience: Transnational Histories of MRI in the United States, Britain, and India*. Cambridge, Mass: MIT Press, 2014.

    Reardon, Jenny. "The Democratic, Anti-Racist Genome? Technoscience at the Limits of Liberalism." *Science as Culture* 21, no. 1 (2011): 25-47.

    Said, Edward. *Orientalism*. Harmondsworth: Penguin Books, 1977.

    Sartre, Jean Paul. *The Imaginary: A Phenomenological Psychology of Imagination*. Translated by J. Webber. London: Routledge, 2004.

    Shapin, Steven. "The Science of Subjectivity." In *4S: Society for Social Studies of Science Annual Conference*. Cleveland OH, 2011.

    Smith, Elta. "Imaginaries of Development: The Rockefeller Foundation and Rice Research." *Science as Culture* 18, no. 4 (2009): 461 - 82.

    Sobchack, Vivian. *Screening Space: The American Science Fiction Film, 2nd Edn*. New York: Ungar Press, 2001.

    Squier, Susan. *Liminal Lives: Imaging the Human at the Frontiers of Biomedicine*. Durham, NC: Duke University Press, 2004.

    Stacey, Jackie. *The Cinematic Life of Genes*. Durham, NC: Duke University Press, 2010.

    Stephens, Neil, Paul Atkinson, and Peter Glasner. "Institutional Imaginaries of Publics in Stem Cell Banking: The Cases of the UK and Spain." *Science as Culture* 22, no. 4 (2013): 497-515.

    Taylor, Charles. "Modern Social Imaginaries." *Public Culture* 14, no. 1 (2002): 95-124.

    ———. *Modern Social Imaginaries*. Durham, N.C.: Duke University Press, 2004.

    Taylor-Alexander, Samuel. "Bioethics in the Making: “Ideal Patients” and the Beginnings of Face Transplant Surgery in Mexico." *Science as Culture* 23, no. 1 (2013): 27-50.

    Teil, Geneviève. "No Such Thing as Terroir?: Objectivities and the Regimes of Existence of Objects." *Science, Technology & Human Values* 37, no. 5 (2012): 478-505.

    Traweek, Sharon. *Beamtimes and Lifetimes:  The World of High Energy Physics*. Cambridge, Mass.: MIT Press, 1988.

    Twine, Richard. "Is Biotechnology Deconstructing Animal Domestication? Movements toward Liberation." *Configurations* 21, no. 2 (2013): 135-58.

    Van Dijck, Jose. *Imagenation: Popular Images of Genetics*. London: Macmillan, 1998.

    Van Lente, Harro. "Promising Technology:  the Dynamics of Expectations in Technological Developments." PhD, Twente University, 1993.

    Verran, Helen. "Re-Imagining Land Ownership in Australia." *Postcolonial Studies:  Culture, Politics, Economy* 1, no. 2 (1998): 237-54.

    Waldby, Catherine. *Aids and the Body Politic:  Biomedicine and Sexual Differences*. London and New York: Routledge, 1996.

    ———. *The Visible Human Project:  Informatic Bodies and Posthuman Medicine*. London and New York: Routledge, 2000.

    Warner, Michael. "Publics and Counterpublics." *Public Culture* 14, no. 1 (2002): 49-90.

    Welsh, Ian, and Brian Wynne. "Science, Scientism and Imaginaries of Publics in the Uk: Passive Objects, Incipient Threats." *Science as Culture* 22, no. 4 (2013): 540-66.

    Wyatt, Sally. "Talking About the Future:  metaphors of the Internet." In *Contested Futures: A Sociology of Prospective Technoscience*, edited by Nik Brown, Brian Rappert and Andrew Webster. Aldershot: Ashgate, 2000.

    Wöhrer, Veronika, and Doris Harrasser. "Playful Experiments: Gendered Performances in a Children's Museum." *Science as Culture* 20, no. 4 (2011): 471-90.

    Yaszek, Lisa. *Galactic Suburbia:  Recovering Women's Science Fiction*. Columbus, OH: Ohio University Press, 2008. [↑](#endnote-ref-12)