**INTRODUCTION**

This article explores the use of imaginaries as an analytical concept within STS. The starting point for the analysis offered here is the observation of its increased use and significance within recent STS research.

It is difficult to begin such a project without offering a working definition of the concept. However, as we shall indicate at various points in this essay, questions about its definition abound and these have helped to shape the various deployments of the term. One of the most useful definitions we have found—which is directly relevant to the use of the term in STS -- is that which Catherine Waldby formulates, citing the influence of the work of Michelle Le Doeuff: ‘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). Another definition was offered by Dilip Parameshwar Gaonkar (2002), in the introduction to a special issue of *Public Culture*, deriving from the reflections of a group from the Center for Transcultural Research which formed to explore the concept of social imaginary (discussed below): ‘an enabling but not fully explicable symbolic matrix within which people imagine and act as world-making collective agents’ (Gaonkar 2002: 1).[[1]](#endnote-2) It is interesting to juxtapose these definitions with the much more specific one offered on the website of the Harvard University National Science Foundation project (Harvard, 2011) which investigated the concept as a tool for STS: ‘imagined forms of social life and social order that center on the development or fulfillment of innovative scientific or technological projects’.

The following sections are laid out to provide a variety of perspectives on the concept of imaginaries in order 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 brief set of genealogical tracings. The most substantive analysis of the article is offered in the two last sections which look, in turn, at the strands of STS work deploying the concept and the issues raised by its usage within STS research.

**IMAGINARIES: TRACKING STS USAGE**

We have identified 117 articles which appeared in what might be characterized as STS journals between 1993 and 2009. While these are peppered throughout the key publications of the field and include articles in the journals considered to be crucial outlets for the field (e.g. *Social Studies of Science*, *Science, Technology and Human Values*, etc.), there have been notably more publications in journals linked to or identified with cultural studies. Hence, *Configurations*, which has included a number of articles on cultural studies of science and technology, has registered more publications using the concept of imaginaries than any other journal. [Check and need note on method.]

In addition to articles, there have been notable book chapters and whole books which derive from STS deployment and development of the concept of imaginaries. These include Sarah Franklin’s (2000) chapter on the popular Hollywood film, *Jurassic Park* , in which she introduces the notion of the ‘genetic imaginary’ (2000). Amongst the STS books that have presented research developed around the concept of imaginaries, George Marcus’s collection – *Technoscience Imaginaries* (1996) -- most obviously announces its conceptual orientation. There is also an important cluster of texts written by feminist STS scholars examining recent developments in the biosciences which work with the notion. These include: Catherine Waldby’s (2000) volume on the Visible Human Project, Susan Squier’s *Liminal Lives* (2004), and Jackie Stacey’s *The Cinematic Life of the Gene* (2010). Much of this work will be discussed in more detail in later sections of this article.

While our charting provides a profile of the field with reference mainly to publications foregrounding the concept of imaginaries, there have been other important sites of its development and use. We have already mentioned the website of the Harvard University National Science Foundation Project on ‘social imaginaries’ which we have considered in our review and there is more on this below. However, a list of other relevant sites might include, in addition to websites: conferences, key lectures, seminars, and other presentations, as well as workshops, etc. Our working assumption is that there is likely to be some concordance between published materials and other outlets for STS research. Thus, we assume both that the concept has been circulating in these sites as well and that our analysis is likely to have relevance to what could be found if we had been able to include these in our investigation.

Finally, it may be important to note that a review article like this raises questions about what counts as STS. We chose to be quite broad and inclusive in our survey for reasons which will be articulated towards the end of the article.[[2]](#endnote-3) Indeed, we suggest that the proliferation of the concept has itself become a marker of the diffusion and increasingly interdisciplinary character of the field in ways that are challenging for STS researchers and scholarship.

**ETYMOLOGY AND STS DEPLOYMENTS**

The etymology of the term ‘ imaginary’ is a fascinating field for investigation in its own right. The *Oxford English Dictionary* defines it as: ‘that which exists only in the imagination’. Hence, the term relates to the imagination and, it is implied, that conventionally it designates that which has no real existence (as in the phrase—‘figments of the imagination’). The entry explains that the word is often pluralised – designating objects of imagination, thoughts or desires. It reports that it has been used in poetry and personal accounts -- associated with introspection, reflection or affective writing. The piece records that, in its early usage, imaginary was ascribed to the individual.

Although the *OED* does not register this, one of the most notable recent developments in the etymology of imaginary has been its nominalization: the shift from its adjectival form to its deployment as a noun. It is this development which has been crucial and extensively utilized in recent STS research. With this shift, imaginaries are grammatically given agency, but, perhaps somewhat contradictorily, they also often become associated with rather abstract processes.

The term often appears in conjunction with a modifier. For example, Le Doeff writes of ‘the philosophical imaginary’ (1989). Some political and social theorists (including Charles Taylor and the other members of the Center for Transcultural Studies group which was organised to explore the concept) have added the label—‘social’. STS scholars have offered their own specifications, most notably: ‘technoscientific’, as in Jasanoff and Kim’s (2009) rendering of ‘technoscientific imaginaries’. Franklin (2000) and Stacey (2010) specify ‘the genetic imaginary’ and Waldby’s coinage is ‘biomedical imaginary’ (2000). In addition, some medical anthropologists have favoured ‘medical imaginary’.

Questions can be raised about the usefulness of some of these modifiers. First, as the following analysis will suggest and as almost all of those using the term within STS indicate, all imaginaries are necessarily ‘social’. In this sense, the addition of ‘social’ seems rather superfluous—in the sense acknowledged by Bruno Latour and Steve Woolgar when they dropped ‘Social’ from the original title of their book, *Laboratory Life* in the second edition (Latour and Woolgar [1979], 1986). However, the persistent use of ‘social’ may be indicative of efforts to challenge popular notions that the imagination is to be associated only with the individual and the personal (as discussed in the outline of *OED* definitions above). Hence, within STS research, by labeling imaginaries ‘social’, researchers emphasise their collective nature and draw attention to embedded visions of the social that are in operation in particular technological and scientific developments or regimes.

It would seem that there are similar issues around the attachment of the adjective ‘technoscientific’ to imaginaries in STS work. Since the focus of such research is necessarily scientific and technological, this qualifier sometimes seems superfluous. 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 may be about challenging assumptions about technoscience as exclusively the realm of facts and, hence, convey the sense that, in using imaginaries with reference to science and technology, researchers are going against the grain of common assumptions about science – identifying its operations, in Waldby’s framing ‘within the terms of what claims to be a system of pure logic’ (Waldby 2000: 137).

As indicated above, some recent deployments of the term have been quite specific. For example, Waldby’s study is of a particular field -- biomedicine-- and her terminology establishes her area of study. An even more particular focus is taken in other work. Hence, Sarah Franklin (2000) and Jackie Stacey (2008) have both used the notion of ‘genetic imaginaries’. Franklin’s coinage seems to have encouraged others to deploy the notion of ‘genetic imaginary’ (see Gerlach 2004; Blaagard, 2009; Jennings 20?). We will also consider below the label ‘practice- bound imaginaries’ which Samson Hyysalo (2006) generates in his symbolic-interactionist project.

Even more recently there has been a cluster of STS investigations which have foregrounded what researchers label as imaginaries *of publics*. Neil Stephens, Paul Atkinson and Peter Glasner (2013) have analysed the imaginaries *of publics* that inform and structure the UK and Spanish stem-cell banks. In Joan Haran’s (2013) case-study of popular media and *Lancet* coverage of the UK hybrid embryo controversy 2005-2008, she highlights the imaginaries *of publics* which animate this reporting. Similarly, Reynolds (2013) and Welsh and Wynne (2013) consider, respectively, the changing *imaginaries of publics* in the UK GMO controversy of the late C20 and early C21 and in various phases of science policy generation in the UK, between 1950 and the present.

**GENEALOGIES OF IMAGINARIES**

In considering the genealogy of imaginary as a concept for STS, there are a number of different streams of theory which have been influential. Our review registers the complexity and plurality in the concept’s genealogy and hence contrasts with the evaluation of the CTS group (Gaonkar 2002: 1) which pointed to the work of Cornelius Castoriadis and, most particularly his book -- *The Imaginary Institution of Society* (1987)-- as having provided the ‘fullest contemporary elaboration’ of the idea of social imaginary. While we also consider Castoriadis to be a major figure within one of the streams in the development of the concept— late twentieth-century political philosophy—we identify a number of other fields which have contributed to the conceptualization of imaginaries. Hence, having reviewed references and affiliations cited in STS usage, we have identified the following streams of work as genealogical resources in the conceptualization of imaginaries:

* classical Western philosophy: particularly Kant’s work and early C20 existential philosophy
* psychoanalysis
* science fiction
* late C20 political philosophy.

Obviously these categories are not discrete. (For example, Western philosophy and psychoanalysis intersect in Lacan’s considerations of the imaginary.) Nevertheless, there are somewhat different concerns and orientations in each of these streams which give them distinctive takes on imaginaries. It is also important to lay-out this range of resources because, as we shall argue below, STS researchers have tended to be rather selective in the resources they draw from in their framings of imaginaries with consequences for their analyses.

**Classical Western philosophy: Kant to existentialism**

Reflections on imaginaries can be traced as a narrow, but significant thread in classical Western philosophy. This trail leads back to Kant’s demarcation between ‘the real’ and ‘the imaginary’ which became a touchstone for modern Western science. It is due to this legacy that recent STS work on imaginaries has, at least implicitly and sometimes explicitly, returned to and questioned this bifurcation. So, for example, Helen Verran (1998) has contended that the deployment of notions of the imaginary in STS research has undermined the common-sense notion (given philosophical credibility through Kant’s theory) that the imaginary is not real.

Jean Paul Sartre*, The Imaginary: a Phenomenological Psychology of the Imagination* (1940; 2004) originally published in 1940 was the first major work to systematically explore the psychological domain of the imagination. For Sartre, the imaginary is the sphere and set of psychological and mental operations associated with imagination. In an introduction to the most recent English translation of this work, Jonathan Webber assesses this text as ‘the most sustained and detailed account of the nature of imagination in Western philosophical literature’ (Webber 2004: xv).

Although it has not been cited in any of the STS research we have consulted, Sartre’s text is important because it carved out a distinctive and powerful domain—designated as the imaginary. As the title suggests, phenomenology was drawn on extensively, particularly the work of Husserl and Bergson, as Sartre established the distinctive modes of imagining as a mental activity. In moving away from mechanistic associationist psychology, Sartre stretched psychology to show that it could encompass a range of human experiences that had either not been tackled or which had been abandoned to metaphysics. By delineating how imagination differed from perception, Sartre was both seeking to identify its key features, but also insisting on its importance as a parallel mode of knowing. His text brought together psychology and philosophy, providing evidence of a distinct structure to the modes of thinking – the realm of the imaginary-- that could be traced and identified. Sartre’s *The Imaginary: a phenomenological psychology of the imagination* (1940) was his attempt to link the personal and the political in a mode that sustained existential philosophy. In this sense, he brought the term into critical political discourse. Sartre’s exploration was of the imaginary as a vital domain of mental operations and knowledge production and, appearing almost simultaneously with Lacan’s distinctive formulations on imaginary, it proved to be an important resource for those working within either philosophical or psychoanalytic traditions.

**Psychoanalytical trails**

Lacan’s essay-- *Beyond the Reality Principle* (‘*Au-dela du “principé de réalité”*’, 1936) is another key text in the genealogy of the concept of imaginaries. Lacan examined psychological life by analyzing how the individual evolved through relating to images. His exploration posited that images could not be dismissed on grounds that they were ‘not real’, given that they were crucial to individual psychic formation. Lacan laid out the stages in psychic development by identifying and characterising particular stages in the subject’s relation to images-- including the mirror stage. In his later work, Lacan, like Sartre, distinguished imagination from perception. Lacan’s prime interest was in subject formation and his challenging of assumptions about subjects being coherent and unified was a striking element of his theory. Lacan set psychoanalysis apart from other forms of psychology that were modeled more directly on the natural sciences. Indeed, his treatise on the imaginary considers the limits of scientific truths, disputing claims that scientific method reveals ‘*the* truth’ on grounds that such knowledge is elusive and unattainable.

It is striking how little STS has drawn on the psychoanalytic tradition in its use of the concept. The Harvard Imaginaries project website does make reference to Lacan and, as we shall discuss below, a number of feminist commentators have drawn on this tradition, but otherwise, it has not been a main resource in the STS adoption of the concept. Nevertheless, it is significant that this tradition has had long-term interests in the imaginary which have involved highlighting subjectivity, foregrounding subject formation, and making reference to the mediated nature of knowledge production (particularly through its attention to images).

**Late C20 Political Philosophy**

As we will outline below, STS scholars have relied mainly on political philosophy in their turn to the concept of imaginary. In so doing they have joined other researchers who have been interested in finding ways of interpreting and characterizing societal and or, in some cases, institutional patterns and orientations. This turn in STS thus mirrors and draws on a somewhat earlier and more generalized set of attempts to characterize political formations. In this regard, the primary reference points have been the work of Benedict Anderson, Cornelius Castoriadis, and Charles Taylor. Those who have used the concept of imaginaries in both political philosophy and STS frequently refer to the theorizing of one or more of these figures.

Benedict Anderson’s *Imagined Communities*

Benedict Anderson’s influential study— *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (1983)-- was a probing of ‘nation-ness, as well as nationalism’ as ‘cultural artefacts of a particular kind’ (Anderson 1983: 13). It has become a canonical text for those interested in nation formation, national identities, and/or nationalism. Anderson’s key insight was that nations were imaginary communities and, thus, that it was necessary to identify the historical development that made affiliation and identification, without direct interaction amongst its members, possible. He explained that the nation: ‘ is *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’ (15).

Although he does not explicitly deploy the notion of the imaginary, Anderson’s historical reflections brought collective imaginative capacities (in effect, imaginaries of community) to the fore as vital elements in the making of nations and nationalism. Anderson identified the mechanisms that conjure and sustain the image of the nation. Hence, he 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 1983: 49). For him, the capacity to imagine the nation—its emergence as ‘an imagined political community’ (15) was of paramount importance. Accordingly, a vital thread in Anderson’s analysis was his historical account of the emergence of mechanisms by and through which such images were generated – specifically, the media forms of the printing press and newspapers

Anderson’s general conceptualization of how collective imaginary capacities are generated and sustained thus 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 and nationalism may be linked to scientific imaginaries in another way. As Jasanoff (2003; Jasonoff and Kim 2009) and some other STS scholars have observed, despite claims about the universality of science, scientific imaginaries are often cast with reference to nations (e.g. national promise and benefits, etc.). Some questions arising from Anderson’s work for STS might include:

* Do national imaginaries and scientific imaginaries operate in similar or different ways?
* What are the media through which scientific imaginaries are constructed?
* Are the processes of address and interpellation at play in the production of national imaginaries different from those in operation around scientific imaginaries?
* How and when are national imaginaries and scientific imaginaries brought together?

Castoriadis and the social imaginary

While Anderson was very much in dialogue with other Marxists regarding theorizations of state formation and nationalism, Castoriadis’s approach to the imaginary emerged from his dissatisfactions with Marxism in the last decades of the twentieth century. From this perspective, he articulated new ways of thinking about the ‘revolutionary project’ with reference to the ‘institution of society’ (as he called them, Castoriadis 1987) and alienation. He was gripped by the failure to acknowledge the subjective dimensions of ‘the idea of another society’ (1987: 90). He arrived at the imaginary through his reflections both on the limitations of Marxism and on how societies function, and his deliberations led to wide-ranging reflections, including the following:

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: Who are we as a collectivity? What are we for one another? Where and in what are we? What do we want; what do we desire; what are we lacking….. 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).

Indeed, the social imaginary became for Castoriadis not only the register of the character of a specific society; it provided the basis for his schema or ‘schemata’ (Castoriadis 1987: ch.4) for distinguishing amongst societies.

Center for Transcultural Studies Social Imaginary Group; Catoriadis and beyond

A few decades later, when a group from the Chicago-based, Center for Transcultural Studies (CTS) decided to explore the concept of the social imaginary in the summer of 1999, like Castoriadis, they were interested in finding new resources to encourage and sustain radical politics. They launched their investigation of imaginaries within a broader political project informed by Habermasian notions of the public sphere, in the wake of the fall of Eastern Europe and in the aftermath of the Cold War. As noted above, they heralded Castoriadis as the paramount political theorist of the social imaginary, who had demonstrated that ‘it is through the collective agency of the social imaginary that a society is created, given coherence and identity’ (Gaonkar 2002: 7). It was not just Castoriadis’s identification of the social imaginary as a vital, but unacknowledged, element in the political realm -- as a ‘world-forming and meaning-bestowing creative force’ (Gaonkar 2002: 6) , but his sense of its ‘hold’ that resonated strongly with this group. They explained: ‘Our response to material needs, however technically impoverished, is always semiotically excessive. We lean on nature but are steered by social imaginary’ (Gaonkar 2002: 7). It was precisely Castoriadis’s stress on the crucial, constitutive role of the imaginary in the making of societies that they regarded as his major contribution to political philosophy and theory: ‘it is through the collective agency of the social imaginary that a society is created, given coherence and identity….’ (Gaonkar 2002: 7).

While Castoriadis’s conceptualization of the social imaginary provided the entry point for their own work, Gaonokar indicates that the CTS group was aware of some problems in his framing of the concept. These begin with Castoriadis’s ‘staggering Eurocentrism’ (Gaonkar 2002: 9), the ‘idealisation of ancient Greece’ and what they characterize as the ‘highly abstract level of ontological reflection’ and ‘grand narrative’ mode (Gaonkar 2002: 9) of his text. They were particularly concerned by Castoriadis’s lack of attention to local detail and they saw this as linked to his generalizing and dichotomizing in his typology of ‘heteronomous’ and ‘autonomous’ societies (Gaonkar 2002: 6-10). They regretted that the variety and multiplicity of social imaginaries and, accordingly, of societies was not fleshed out in Castoriadis’s abstract account.

The CTS group, consisting of Benjamin Lee, Charles Taylor, Michael Warner and Dilip Parameshwar Gaonkar drafted a statement on ‘new imaginaries’ which revolved around what they identified as five key ideas. These were that:

* 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 that this stranger sociability was made possible through mass mediation.
* The national people is a paradigmatic case of modern social imaginary…[its] distinctive features include its representation as ‘we’; its transparency between individual and collectivity; its agential subjectivity.
* A national people lives amid many other social imaginaries, penumbral to them.
* The agency of modern social imaginaries comes into being in a number of secular temporalities rather than existing externally in cosmos or higher time (Gaonkar 2002: 5).

Charles Taylor: modernity and social imaginaries

The Canadian political philosopher Charles Taylor’s essay (Taylor 2002) is described as providing the ‘conceptual frame’ (Gaonkar 2002: 10) for the special issue of *Public Culture* on social imaginaries produced by the CTS group. This essay also staked the terrain for Taylor’s subsequent book with the same title, *Modern Social Imaginaries* (2004). Taylor’s work both sought to address what the CTS group regarded as weaknesses in Castoriadis’s theorization of the social imaginary and to register global political developments of the early C21. Taylor’s analysis has become a key reference point in the political philosophical tradition of theorizing the social imaginary. At the core of the account presented in both publications is a sketch of Western modernity which Taylor saw as originating as a ‘new vision of moral order’ (Taylor 2002: 92) which he contended was first articulated by a set of ‘influential thinkers’ in the C17, beginning with the natural law theories of Grotius and Locke (Taylor 2002: 91-3), and which subsequently percolated into the social imaginary of Western societies more generally.

In this preliminary essay Taylor offered ‘an account of the forms of social imaginary that have underpinned the rise of Western modernity’ (Taylor 2002: 92), thereby establishing the specificity of Western modes. He argued that: ‘central to Western modernity is a new conception of the moral order of society’ (Taylor 2002: 92). Whereas Castoriadis had propounded a dualistic framework for characterizing social imaginaries, Taylor insisted that the Western social imaginary was very particular, that it sustained a specific version of modernity and, while it was difficult for those caught up in it (Westerners) to discern this, that it was important that this specificity was acknowledged. Taylor’s narrative traces the development of ‘the modern theory of moral order’ which later ‘infiltrates’ (his term Taylor 2002: 110) the social imaginary, mapping C17th and C18th intellectual contributions in the conjuring of Western modernity.

In investigating Western moral order, Taylor maintained that ‘what is originally just an idealization grows into a complex imaginary through being taken up and associated with social practices’ (Taylor 2002: 110). As this suggests, the article also offered a set of reflections on the nature of the social imaginary. Taylor eschewed idealistic versions of the social imaginary, insisting that it was ‘not a set of ideas; rather it is what enables, through making sense of, the practices of society’ (Taylor 2002: 91). He reflected that: ’the social imaginary is that common understanding that makes possible common practices and a widely shared sense of legitimacy’ (Taylor 2002: 106) and ‘…which enables us to carry out the collective practices that make up our social life’. For Taylor, the social imaginary was thus ‘the understanding expressed in practice’ (Taylor 2002: 108).

Taylor’s later book, published in 2004, cited Anderson’s *Imagined Communities* as well as the work of Jurgen Habermas, Michael Warner, and Pierre Rosanvallon (Taylor 2007: 2), as influences in his fleshing out of the arguments presented in skeletal form in the earlier essay. This included outlining how the four forms of social existence identified in and through the Western modern imaginary—the economy, the public sphere, the sovereign people and the notion of rights independent of political structures—emerged (see esp. pp. 172-173). Chapter 2 is devoted to answering the question: ‘What is a “social imaginary”? In his clarification of 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’ (Taylor 2004: 23) and ‘as the way we are able think or imagine the whole of society’ (Taylor 2004: 69).

Taylor had warned in 2002 that ‘once we are well installed in the modern social imaginary, it seems the only possible one’ (Taylor 2002: 99). Hence, his book extends and develops his arguments about there being ‘different paths of contemporary modernization’ (196). Indeed, he framed his historical review as providing an argument for acknowledging plurality, challenging the practice of ‘seeing modernity as a single process of which Europe is the paradigm’ (196). In the last chapter – effectively a coda to the book’s main project-- he suggested that his efforts to outline the features of the Western modern social imaginary constituted a contribution to the ‘provincializing of Europe’ complementary to the work of the postcolonial scholar Dipesh Chakrabarty (Taylor 2004: 196).

Despite his commitment to decentring Europe, Taylor never seems to question the assumption that there would be other modernities or that the notion itself might be Eurocentric. His project is deeply embedded in Western liberal rationalism. The principles of Western modernity are presented as originating from the theories of the classic figures of Grotius and Locke and as gradually pervading the rest of society. The notion of moral order is seen as originating in elite intellectual thought – that of social contract theorists—and as gradually seeping down through the Western social order. Europe is assumed to be an unproblematically cohesive unit. Moreover, Taylor does not consider the powerful feminist critique of social contract theory offered by Carole Pateman (1988). Indeed, despite his occasional acknowledgements of gender inequalities, he reiterates and re-instantiates the liberal vision of a masculinist political order.

Clearly Taylor’s formulations have been influential in explorations of broad notions of social imaginaries. While, considerations of scientific imaginaries may be more focused and specific, Taylor does offer some interesting perspectives which may be relevant to STS. He anticipates and handles the charge that the concept of social imaginary ‘smacks’ of idealism assertively:

I think this kind of objection is based on a false dichotomy, that 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 2007: 31-2).

In his analysis of the American Revolution, Taylor offers other suggestions regarding the conceptualization of the social imaginary which could have relevance for considerations of scientific imaginaries. He notes that the social imaginary is ‘what makes sense of our practices’ and that it constitutes a ‘kind of repertory … including the ensemble of practices they can make sense of’ (115).

Our exposition of twentieth-century political philosophy as a genealogical stream for conceptualizations of imaginaries has been quite extensive and detailed because, as we will outline below, it has been a key resource for STS on imaginaries. We have been struck by a relative lack of critical commentary about the adaptations and translations of this tradition into STS. Our commentaries and questions on specific theories are necessarily limited but they are intended to provoke more reflection on the relationship of STS research to this channel of political theory.

**Science fiction**

Science fiction is the literary genre preeminently identified with the imaginative exploration of technoscience in its various manifestations and potentials. Commentators on the history of the genre cite a range of texts appearing during the C17 and C18-- such as Johannas Kepler’s*, Somnium* (1620-1630), Margaret Cavendish’s, *The Description of a New World, Called the Blazing W*orld (1666), Jonathan Swift’s *Gulliver Travels* (1726; 1735 ), and Voltaire’s *Micromégas* (1752) as the prototypes of this literary form. Mary Shelley’s *Frankenstein* (1818) has been heralded as the first full-blown science fiction text and H.G. Wells is often cited as ‘the father of SF’ who offered prototypes for the genre (Wells 1895; 1896). Nevertheless, the emergence of SF as a distinct genre is often linked to the appearance of the periodical publications --*Amazing Stories* (from 1926) and *Astounding Stories* (from 1930). These publications were crucial to the emergence of a community of SF authors, editors and fans which proliferated and differentiated during the C20.

In a recent analysis of a cluster of SF publications, the literary scholar Lisa Yaszek observed: ‘SF enables authors to dramatize widespread cultural hopes and fears about new technoscientific formations as they emerge at specific historical moments’ (Yaszek 2011: 385). In fact, SF is often characterized as ‘speculative’ fiction, since it extrapolates from technoscientific developments to their future consequences and prospects. In this sense, it is the literary genre which is pre-eminently identified with exploration of technoscientific imaginaries.

SF has often been regarded as ‘the other’ of science and of scientific facts, in particular, and there has been much play on this dichotomy. Until fairly recently, the division between science, as the domain of facts, and science fiction was not only noted, it was (re)produced and reinforced within STS. In fact, until recently, there was scarcely any mention of SF in STS, as researchers tended to regard science fiction as irrelevant to the field.

Donna Haraway broke with this pattern and challenged this assumption. In her ‘Cyborg Manifesto’ (1985; 1991) she hailed feminist science fiction writers as story-tellers, musing on what it means to live in and with modern technoscience. In *Primate Visions*, published in 1989, science fiction provides a crucial pivot in Haraway’s representation of the twentieth-century science of primatology, culminating in the final chapter or ‘Reprise’, subtitled assertively: ‘Science Fiction, Fictions of Science and Primatology’. In this chapter, Haraway juxtaposes the SF writer, Isaac Asimov’s projected institution -- his ‘imagination of the Second Foundation’ taken from his *Second Foundation* (1964[1953]) (Haraway 1989: 369) with Stanford’s Second Primate Project, 1983-1984 (the Stanford University project on primates which Haraway researched and represented in this book). Haraway posits that ‘Asimov’s story provides a loose-fitting, but still suggestive, way to read the Center for Advanced Study in the Behavioral Sciences’ second Primate Project in 1983-84’ (370). She reminds her readers that:

Throughout *Primate Visions*, 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 (p. 370).

Haraway takes her experimentation with science fiction one step further, in the final section of the chapter in which she turns to a more recent science fiction text—Octavia Butler’s, *Dawn* (1987) (the first of Butler’s trilogy on Xenogenesis (1987, 1988)). Haraway was attracted to how Butler had used ‘the conventions of science fiction to fashion speculative pasts and futures for the species’ which seemed ‘deeply informed by Afro-American perspectives with strong tones of womanism or feminism’ (p. 378). This inspired Haraway towards similar experimentation. Just as Butler’s science fiction had explored alternative narratives and futures, Haraway was interested in unhinging ‘the primate order’s unfinished narrative of traffic across the specific cultural and political boundaries that separate and link animal, human, and machine in a contemporary global world where survival is at stake’ (381-2). She invites her readers to take ‘the next logical step’ of moving ‘from reading primatology as science fiction’ to ‘reading science fiction as primatology’ (376).

Drawing on the tropes of science fiction, Haraway challenged her readers to consider how the core narratives of the science of primatology could or might have been different. Haraway’s bringing together of STS and SF was in itself a radical step in itself, given the widespread disavowal of science fiction by STS. Moreover, her specific experimentation with science fiction opened-up questions about the imaginaries of modern sciences, including primatology and the prospects for alternative versions and visions of technosciences.

**CLUSTERS OF STS WORK WITH IMAGINARIES**

In the preceding section, in the course of reviewing some of the main threads in the genealogy of the concept of imaginaries, we have already indicated some variety in the ways in which STS researchers have engaged with and related to this notion. In this section we provide a more comprehensive mapping of the main clusters of STS research around imaginaries. As this will suggest, while there are a number of different patterns which can be discerned in tracing STS research focused on imaginaries, turning attention to notable methodological and theoretical orientations highlights diversity and clustering within the field. We have categorized the research which we surveyed and in the following section we discuss exemplary contributions to STS under the following labels:

* anthropological/ethnographic
* socio-political/institutional
* symbolic–interactionist
* historical
* feminist

**Anthropological STS**

George Marcus (ed.)*Technoscientific Imaginaries*

The use of the concept of imaginaries has probably been most evident in anthropological STS. Several prominent anthropologists of science have deployed it in publications which have appeared since the end of the twentieth century. The most prominent of these publications is probably the collection of articles edited by George Marcus, entitled, *Technoscientific Imaginaries: Conversations, Profiles, and Memoirs* (1995). Despite the title there are few references to imaginaries in the volume itself. Nevertheless, in the introduction to the collection Marcus explains that: ‘The term imaginary emerged effortlessly and just seemed to fit the topic’ (3) of the volume which was, in his terms, ‘an optimistic assemblage’ (p.3 ) of studies of the conditions of work in science and technology at the end of the twentieth-century.

Marcus assessed that the prime interest of the investigators who contributed to the collection was 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’ (p.4). This leads into his reflection on the version of 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 1995: 4).

This version of techoscientific imaginaries derives from and relates to the tensions around the positioning of scientists. The term is used to characterize how scientists deal with the specificity of their contemporary situations, whilst engaging in and generating future visioning. Marcus notes that, if future visioning figures in these circumstances, 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’ (p.4). Hence, according to Marcus, 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 1995: 7).

Karen-Sue Taussig and geographical imaginaries in STS

While Marcus invokes imaginaries in presenting a set of studies of the work of contemporary scientists, and uses this to propose a possible reorientation of the STS field, Karen-Sue Taussig (1997) deploys the concept in undertaking a detailed study of the take-up of a specific technology in a particular location -- pre-implanation genetic diagnosis (PGD) in the Netherlands. Taussig detects the operation of understandings of difference(s)—geographical, social and religious—as playing out in 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 the work of Edward Said on *Orientalism* (), Taussig contends that, in her specific case-study of a young Dutch couple from Zeedrecht, a village in a region of the Netherlands identified with strict Calvinism, through such imaginaries, behaviours 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 is often rendered in terms of geographical locality and given widespread currency. Taussig demonstrates that how people imagine the world and others may not necessarily be accurate, but that it may have great consequences, particularly in the operations of technoscientific practices and procedures such as PGD.

Helen Verran, comparative perspectives of and denial of imaginaries

While Taussig’s ethnography pertains to a specific technoscientific practice in one location, Helen Verran undertakes a comparative ethnographic project, which pivots on claims to land ownership. Her study was triggered by legal disputes occurring towards the end of the twentieth-century when Cape York pastoralists (Australian Aboriginal claimants) challenged the development of a bauxite mine on land they understood their clans to own. Referring to this context, Verran 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 comments:

Looking at some of their puzzles [those 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: 238).

Verran presents her essay as a contribution to both postcolonial studies and science studies. She is offering resources to postcolonial studies for negotiating contested knowledge and property claims. For STS, she 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 see it: ‘they have always lived in a world in where knowledge has no imaginary. Modernity circumscribes its imaginary as of aesthetic, but not ontic or epistemic interest’ (243). Verran insists that ‘doing without imaginaries, denying the pictures and stories inherent in our knowing is a luxury which can no longer be justified, if indeed it ever could be’ (243). She explains: ‘My claim is that by restoring imaginaries to modern theories of knowledge, we will rediscover the capacity to re-imagine ourselves, and devise ways they [WE?} can work with other communities—human and non-human’ (Verran 1998: 249).

Verran’s take on imaginaries was linked to her reading of Kant’s work by way of that of Michele Le Doeuff. She notes that Kant regarded the exclusion of the imaginary as the defining property of reason, but that paradoxically he could only represent this exclusion through the use of imagery and extended metaphors (picturing and storytelling). Verran proposes to take Kant’s metaphor of the island—the territory of pure understanding – seriously. She contends that: ‘To take the metaphor seriously is to see that it is through being lived space that both the island and the seas become meaningful. Taking the metaphor seriously makes the notion of empty space untenable ‘(245). In comparing the ontic and epistemic commitments of Western and Australian Aboriginal knowers, Verran suggests that both knowledge systems combine imaginaries and logics. However, the key difference that she highlights is the open acknowledgement of the making and transversing of boundaries in Aboriginal communities: ‘the paradox inherent in meaningfulness, in making ontic/epsistemic commitments, is acknowledged and celebrated’ (248).

Imaginaries are very much associated with practices, not minds, for Verran. It is in the everyday messing around with mucky, obdurate stuff, and in conversations and other texts that imaginaries are enacted and enact. For Verran, the imaginaries imminent in practices interpellate objects/subjects that/who are implicated in and by the practices, thereby constituting them as objects/subjects (252). She insists that imaginaries must be acknowledged and recognized, together with their operations in what she calls a ‘logic’ in performative modes of knowledge production. These are crucial developments for Verran if ‘an unacknowledged politics of coercion and insidious translation’ , which she identifies with Western scientific thinking, is to be disrupted (252).

Joan Fujimura, scientists’ imaginaries and a ‘sociology of the future’

Joan Fujimura situates her study of imaginaries within the anthropology of science and technology.[[3]](#endnote-4) She argues that the crafting of future imaginaries may constitute part of the work of scientists. To illustrate this she considers the work 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 a revisioned version of Japanese culture that registers its uniqueness in the context of transnational economy in biology, genomics and computing.

Fujimura 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’ (Fujimura 2003: 192). For her, imaginaries are enabling visions that involve persuasive rhetoric and possibly hyperbole, but which facilitate community formation and the marshalling of resources.

As the label ‘*future* imaginaries’ signals, Fujimura is particularly interested in the temporal orientation of imaginaries. She concludes her essay with a call for a ‘sociology of the future’ that would enroll social scientists in efforts to intervene in the envisioning and shaping of futures. Her emphasis on technosocial imaginaries as being implicated in national formations anticipates Jasanoff and Kim’s (2009) later comparative study of technoscientific imaginaries around nuclear technology in Taiwan and the USA.

Kim Fortun and Mike Fortun, ‘civic science’, imaginaries and STS

Kim Fortun and Mike Fortun (2005) studied the recent state of the science of toxicology, regarded by some of its practitioners as a ‘civic science’. Fortun and Fortun identified themselves as supportive of 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 suggested that anthropologists and other STS researchers may be able to help in facilitating this vision of toxicology.

They argued that, through a study of imaginaries, as they are articulated by scientists, ethnographers might– in the spirit of ‘friendship’ – help scientists negotiate change in their field, by enabling them to engage more fully with the social, ethical and legal implications of their practices. For Fortun and Fortun the notion of toxicology as a ‘civic science’ is:

something that scientists think about and pursue through practical projects. In anthropological terms, it is the product of an ‘imaginary’, in which different modes of sense-making come together (Fortun & Fortun 2005: 44).

Referencing Marcus’s (1995) discussion of ‘technoscientific imaginaries’, they suggest that the study of imaginaries provides a way of looking at large-scale changes over time and at how these are understood locally. Moreover, they contend that, through a focus on imaginaries, analysts can study the forces that are constitutive of subjectivity and they signal their interest in understanding subject formation by extending Sharon Traweek’s (1988 ) exploration of subject formations within and through scientific practices.

Fortun and Fortun’s appraisal of the prospects for toxicology derive, in part, from their interviews with some leading toxicologists who, in turn, articulate their visions of a ‘civic science’, with reference to a range of historical events and experiences from the Bhopal (India) nuclear disaster of the 1980s to recent epistemic and technical changes linked to genomics and informatics. Fortun and Fortun read their interview material as providing evidence of imaginaries articulated in these commentaries and in the practices their interviewees cited.

Fortun and Fortun deploy the term imaginary as part of their effort to create new opportunities for refashioning toxicology and for redefining its orientation. They call upon anthropologists and other scholars from the humanities and social sciences, to undertake ethnographies ‘of ethics and friendship with the sciences’. They claim that the ability of ethnographers to draw out ‘scientific imaginaries’ contributes, not only to anthropological theory and methods, but also to the ability of this field to shape the future direction of sciences such as toxicology. By focusing on scientific practice and by being ‘friends’ of scientists—rather than critics (which they see as the dominant mode of recent STS)—Fortun and Fortun contend that ethnographers can access the imaginaries of the sciences. According to their assessment, such articulations may allow social scientists to help scientists negotiate change in their scientific fields and address the social and ethical aspects of their sciences more adequately.

The brief reviews offered above provide 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, who work within a discipline traditionally concerned with culture, engaging in the study of imaginaries. Moreover, the common element in all of the specific studies mentioned above is methodological in that they are all ethnographic studies. However, they differ in focus, with much of the anthropological STS focused on particular scientists , scientific communities or specific technoscientific sites (e.g. laboratories or clinics) but, with some studies (such as Taussig’s) investigating the imaginaries of non-professionals (in her case, those using PDG testing) or, in Verran’s case, undertaking a comparative of western scientific and Australian aboriginal knowledge systems . Finally, we note that for some of the STS scholars mentioned in this section, researching imaginaries becomes something more than a theoretical or methodological path taken in their own research. In fact, they recommend its use as a potential reorienting tool for STS more generally. We will return to this in the concluding section of this article.

**Socio-political/ institutional imaginaries**

Sheila Jasanoff and Sang-Hyun Kim and ‘sociotechnical imaginaries’

A second strand of STS research has drawn much more heavily on political theory in its use of the concept of imaginaries. Methodologically orientated towards analyzing and characterizing the policies and practices of states and large institutions, this work has not relied on ethnographic modes. One of the most cited examples of this orientation 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 orientating STS research towards the study of national and state technoscientific policies and politics. As will be discussed below, in response to this, some researchers have argued that exploring the imaginaries of other political institutions can be an equally important focus for STS research (Smith 2009, see below). 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) undertook a comparison of the reception and regulation of civil nuclear power technology in the USA and South Korea. They developed their analysis with reference to their contention that the relationship between science and technology and political institutions has been relatively neglected by STS. Prompted by this assessment they pose the question: ‘How do national science and technology projects encode and reinforce particular conceptions of what a nation stands for?’ (Jansanoff and Kim 2009: 120). Setting-out to explore how national political orders and technoscientific projects co-produce each other, they offered a definition of national sociotechnic 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’ (120). They add that such imaginaries ‘at once describe attainable futures and prescribe futures that states believe ought to be obtained’ (120) and that they operate ‘for us in the understudied regions between imagination and action, between discourse and decision, and between inchoate public opinion and instrumental state policy’ (123). Jasanoff and Kim undertook and encouraged cross-national comparisons, on grounds that, despite globalization, sociotechnical imaginaries are intertwined with the national sphere—with the production and reproduction of nations. They insisted that the national is not simply given or immutable, but continuously ‘reimagined, or re-perfomed, in the projection, production, implementation, and uptake of sociotechnical imaginaries’ (123). They suggested that historical analysis is required to see how these imaginaries are ‘invoked and re-performed at key turning points in policy formation’ (122).

Methodologically Jasanoff and Kim rely heavily on textual analysis – of policy documents, speeches and public discourses. They note that: ‘Language is a crucially important medium for the construction of the imaginaries’ and they identify and compare ‘recurrent discursive elements in each country’s official policy narratives for nuclear power’ (122). However, they acknowledge that ‘mass media, popular culture, and visual materials’ also merit attention, since they ‘play critically important roles in the articulation of sociotechnical imaginaries’ (122, n.2). Their empirical conclusion is that two quite distinct imaginaries are identifiable from their analysis—an ‘imaginary of containment’ for the USA and an ‘imaginary of development’ for South Korea (epitomized by the contrast between the slogans-- ‘Atoms for Peace’ and ‘Atoms for Development’ (121)).

This comparative case-study is bolstered by a brief survey of resources and relevant research in their study of sociotechnical imaginaries. They start with Sarewitz (1996) to make the point that ‘imagination is no longer seen as mere fantasy or illusion’ but instead, regarded as a cultural resource that brings into being new forms of life. Castoriadis (1987) is commended for making the point that the imagination is not an aesthetic capacity of individuals, but rather that it produces collective interpretations of social reality through shared systems of meaning. Anderson (1983) is invoked for drawing attention to the shared meanings that are crucial in the formation and substance of imagined communities—particularly nations. Edward Said’s (1978) analyses of othering is cited as a crucial reminder of this aspect of community formation. Foucault (1979), Scott (1998), and Bowker and Star (2000) are mentioned as providing insights about how imaginaries contribute to the standardization of human subjects in ways that render them governable. Jasanoff and Kim also note the work of Appadurai (1996) and Taylor (2004) as being particularly useful in foregrounding the role of imagination as an ‘organized field of social practices’ and as a ‘key ingredient in making social order’ (122).

Jasanoff and Kim also discuss a cluster of STS work which they regard as either implicitly or explicitly sharing their interest in sociotechnical imaginaries. They distinguish between STS and histories of science and technology because they claim the latter field has tended to regard the imagination as an individualised mental capacity, whereas within STS, ‘promises, visions and expectations of future possibilities’ are considered to be ‘embedded in the social organization and practices of science and technology’. (Here they cite the work of Fujimura (2003) and MacKenzie (1996).) Reviewing his related edited volume (1995), they also distinguish between Marcus’s term -- ‘technoscientific imaginaries’ – and their coinage—‘sociotechnical imaginaries’ on grounds that the latter are not seen to operate exclusively through technoscientific practices. Instead, they argue that such imaginaries of technoscience also carry assumptions of the public good for ‘the social world writ large’ thereby ensuring that “technoscientific imaginaries” are simultaneously also “social imaginaries,” which encoding collective visions of the good society’ (123).

A further strand in their clarification of the conceptual scope of imaginary is their contrasting of it with other concepts that have been used in exploring the cultural, social or political dimensions of technoscience, such as ‘policy agendas’, ‘master narratives’, or ‘media packages’ around ‘discursive frames’. They clarify that imaginaries are less explicit, issue specific, and instrumental than policy agendas, since they ‘reside in the reservoir of norms and discourses, metaphors and cultural meanings out of which actors build their policy preferences’ (p. 123). However, they claim that imaginaries are more instrumental than master narratives and that they ‘project visions of what is good, desirable, and worth attaining for a political community’ by articulating feasible futures (123). They note that, while they project hopes and promises, imaginaries may also project fears and risks around innovation. They explain that, in contrast with discursive frames found in media packages, ‘sociotechnical imaginaries as we define them are associated with active exercises of state power’ and, while multiple discursive framings may circulate in any society, some become filtered and selected, some emerging as dominant, embedded in the goals and priorities of state and public action.

Elta Smith and imaginaries of development

Elta Smith analysed the changing representations over fifty years of rice research undertaken by the Rockefeller Foundation. Her study reviewed different framings of problems and potential solutions by the Foundation and how these incorporated wider ideologies, epistemologies and networks. The initial question she poses is: how do powerful philanthropic institutions, such as the Rockefeller Foundation, determine their programmatic and funding priorities, and ‘how do they influence and respond to global politics through their engagement with science and technology?’ (461). She notes that the Foundation’s rice research is not only an agricultural modernization project, but also ‘simultaneously a sociopolitical project that extends particular modes of governance’ (461) and that ‘science and technology are imagined to powerfully generate social and economic advancement’ in a way that shapes policy (462). Her investigation leads to her positing that there were two key Rockefeller ‘representation strategies’ of ‘paternalism’ and ‘homogenization’.

Smith uses ‘the term imaginaries to characterize the Foundation’s conceptions of “development” and its changing role in rice experimentation over time’ (142) and she explains that this term can ‘highlight the ambiguities and normative content’ of the Foundation’s projects. Briefly referring to literature on imaginaries, she defines the term and clarifies how she will use it. First, she observes that an imaginary is a ‘particular, often complex view of the world that comes to shape agendas, research trajectories, projects, and policies’ (462) noting here the work of Taylor (2004) and Anderson (1991). Next, she indicates that she will use 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’ (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 (1996)’s evaluation that it is an ‘organized field of social practices’ (462). She mentions Jasanoff’s (2006) concept of a ‘sociotechnical imaginary’, defining this, in the case of imaginaries of development, as being ‘comprised of scientific and technological imperatives as well as economic, political and cultural ones… hence, *sociotechnical*’ (462).

Smith briefly relates the term imaginary to similar concepts in social science, observing that ‘imaginaries are complementary to and overlap with the concept of “discourse”’, particularly as elaborated in development studies literature, where discourses are taken to be ‘institutionalized modes of representation’ the study of which can focus on ‘the uptake of ideology into beliefs and actions’. Smith doesn’t explicate how these terms may differ or how they relate to each other. Indeed, her terminology tends to slide between imaginaries and representations without any clarification as to whether these terms are interchangeable or distinct. However, she does comment 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’ and that ‘discourses are an important component of this process’ (463). The imaginary is declared to be ‘future-oriented, but also, constrained by present and historically produced conditions, whether cultural, technical, scientific or political’, with Smith citing Marcus (1995) in making these points. In addition, imaginaries are also described as reflecting ‘larger socio-political and technoscientific understandings and sensibilities’ that include ‘Cold War and market-based ideologies, and the belief that science and technology can solve social problems’ (463). Smith 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’ (ibid).

Her key findings pertain to what she labels as the predominant representational strategies employed by the Rockefeller foundation of ‘paternalism’ and ‘homogenization’. She regards these strategies as directed toward ‘both the scientific research objects under study – in this case rice—and the people thought to benefit from this research’. Paternalism characterizes the way the foundation deems it necessary to intervene on behalf of human populations and food grains (463), evidenced in terms such as ‘developing world’ and ‘orphan crop’ (both suggesting child-like states). Homogenization entails representations of both ‘rice’ and ‘the developing world’ as singular objects and subjects of invention, involving universal, generic and replicable sets of tools, programmes and policies (463). She assesses that the Rockefeller Foundation representations project the third world ‘quite seamlessly as a unified space with common problems’ that can be solved through the Foundation’s work on rice as a universalized object that can be improved via a central laboratory, eliding more complex questions about diverse soils, climates and cultures (476).

In invoking the term imaginaries, Smith claims that the Foundation’s research entails much more than a series of agricultural experimentation projects: ‘it is simultaneously a social and political project to extend particular modes of governance’ (463). She notes: ‘I use the concept of “imaginaries” to call attention to the modalities of governance through non-state institutions such as the Rockefeller Foundation. In this sense, “imaginaries” function as a mechanism of governance, in the way one might think of agenda setting in conventional political analysis’ (463). Hence she comments that: ‘Such imaginaries invite power to be transferred in one direction’ (475).

Smith concludes by noting how ‘imaginaries of development have history and politics’ (479). She observes that, between the early 1900s and the 1980s, the imaginaries ‘projected and actualized by the Rockefeller Foundation found their roots in the early twentieth-century and in late Cold War imperatives’ with an ‘imaginary of agricultural science and development… constituted around a bi-polar politics of security’ (478). Here eliminating hunger was part of this larger Cold War ideological battle. She detects, after the 1980s, an ‘emerging set of neoliberal values, in which the control of life became a naturalized part of the economic value-system and could be effected through market logics that predominated over the state or other institutions’ (ibid).

This analysis enables Smith to ‘spotlight’ the ways in which ‘non-state actors who control the agenda for devising and implementing new technologies participate in producing global politics’ (479). She observes that the Rockefeller Foundation and ‘a small number of foundations have extraordinary power to shape the course of education, research, and institutional development’ through control of massive funding that is almost completely unaccountable and grants them ‘virtually complete autonomy’ in their agendas. Such agendas are conditioned by powerful imaginaries where global scale is given by the ‘constructed universalism of molecular biology’, combining the practice of plant breeding, political ideologies, analytic practices, and the ‘notion that science and technology can solve fundamental social problems’ (ibid). Such foundations, by ‘simultaneously controlling the use and meaning of a staple crop as well as the purported beneficiaries’ are able to gain influences that are geopolitical, socio-cultural and economic in scale. Smith takes Jasanoff’s notion of ‘sociotechnical imaginary’ and applies it to an actor that is beyond any national or state-bounded political sphere. The complex web between science policy, civil society, and the state that Jasanoff and Kim’s analysis uncovers becomes less defined.

The socio-political/institutional thread of STS work on imaginaries has been an influential one and the Harvard project on socio-imaginaries has been a valuable resource for STS researchers. What distinguishes this orientation towards imaginaries is its foregrounding of issues of governance and, to some extent, policy. Methodologically, thus far, much of the research undertaken in this mode has been predominantly realized through textual analysis (of various sorts) and there has generally been an historical 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. We have noted that Smith’s project proposes a broadening of the state focus to include other key institutions in the exploration of technoscientific imaginaries. In terms of genealogical resources, we have also noted that this stand of STS research relies heavily on late twentieth-century political philosophy.

**Symbolic-interactionist Imaginaries**

Sampsa Hyysalo and practice-bound imaginaries

Another smaller cluster of STS research has come at imaginaries through symbolic-interactionist theory. Sampsa Hyysalo’s (2006) study is exemplary in this regard, involving as it does, an investigation of practices as the nub of the study of imaginaries. Analyses of representations are used as the way into this research. Hyysalo argues for a particular way of conceptualizing how professionals predict and prefigure the use of technology in design. The term ‘imaginary’ is a crucial component of his conceptual apparatus and he nominates the notion of ‘practice-bound imaginary’ (PBI) to be used to examine user-representations in the construction of a novel healthcare technology for elderly people. He explains this concept early on in the essay, before applying it to his case-study (of ‘Wristcare’—a wrist device for medically monitoring elderly people) and then he explicates the professional practices in which user-representations of Wristcare were generated.

Hyysalo’s description of his case-study suggests that his use of the concept of imaginaries is a response to his awareness of the *complexity of participation* in technology design. He is trying to explain how different groups of professionals (engineers, medical experts, care-givers, etc.) produced and negotiated representations of the user in designing Wristcare. In the first part of Hyysalo’s account, Wristcare is described as a ‘techno-economic invention from heterogeneous resources that failed to fit the practices of users’. Hyysalo develops the concept of PBI to describe a process by which complicated elements were eventually ‘interlinked’, ‘inter-animated’ and ‘aligned’ in ways that led to a successful user-representation of Wristcare.

Hyysalo outlines his version of the distinction between PBI and technology frames (TFs). The latter term is respectfully described as a concept that mediates or modulates the relationship between actors and technology: ‘The frames are seen to be located not in actors or in technology, but as a “hinge” between actors and technology. Different relevant social groups give different meanings for artefacts through different TFs’ (Hyysalo, 2006: 603). However, he notes that:

In joint action, individuals, teams and activities interpret practices differently and combine them in novel ways with other practices. What follows is that instantiations of PBIs are often unique, both in terms of the combination of practices involved as well as in the way people and activities interpret and participate in those practices. PBIs, in turn may instantiate a unique recombination of more pervasive “incomplete utopian projects” (Gregory, 2000), ideographs (von Lente, 2000) and other cultural resources. Attention should therefore be paid to inter-animation, layeredness and conflicts between different PBIs from which a design team or an activity draws…This is hard to do with the way ‘relevant social groups’ and ‘TF’ have been conceptualized to date (2006; 604).

Hyysalo distinguished between technology frames (TFs) and PBI, explaining that the latter: ‘Emphasizes that change and continuity are *intertwined*, *multifaceted* and *partial*. It thus sensitizes the analyst to searching for patterns and stability in change’ (2006: 604, my emphasis). Thus, for Hyysalo, PBI is a concept designed to help the social researcher address the complicatedness and messiness of social organization in technology design, making it more likely that subtle differences and fine-grained details within complex social organizations will be registered. In this version of imaginaries, which is located within the symbolic interactionist tradition, the concern is with generating better understandings of how user-representations (i.e. representations of prospective use) lead to successful design applications.

Hyysalo is connecting imagination and technology design in his conjuring of PBIs. He cites a range of resources and references on the ‘imaginary’ which he takes as indicative that the term ‘has recently become more popular’, referring explicitly to the fields of cultural studies, feminist theory and STS. In offering his own set of reference points, he notes that imaginary: ‘Like imagination …evokes both vision and fantasy, while emphasizing the corporeality and specific cultural and historical resources present in imagining’. He dismisses as misunderstandings, the association of the concept with image, imagination , imagery or the colloquial meaning of imaginary as “existing only in the mind”.’ He attributes its appeal to the ‘way it connects vision and fantasy to ways of perceiving and meaning-making. (Verran 2001; Marcus 1995), Verran 1998, Castoriadis, 1987, Fujimura 2003)’.

Since Hyysalo’s is the only example of a symbolic-interactionist approach to imaginaries considered here—it is difficult to generalize. However, because this study is firmly embedded in symbolic-interactionist theory and method and hinges definitively on the concept of ‘practice-based imaginaries’, its features merit review. Like many of the researchers considered in this article, Hyysalo’s primary interest is with the technoscience imaginaries of technoscientific professionals (in his study, designers). Like many other STS researchers, his approach resists idealized notions of imaginaries and his emphatic term ‘practice-based imaginaries’ signals this and alludes to the symbolic-interactionist theory and method he deploys. Nevertheless, Hyysalo does envisage imaginaries as providing a bridge between the more psychoanalytic understandings of the imaginary (associated with vision and fantasy) and a symbolic interactionist focus on social interaction and meaning-making. Hyysalo uses the concept of imaginary to identify the prospective envisioning work undertaken by some professionals involving imagining users’ expectations and conduct, deploying this to improve design. For him, the imaginary is much less a domain (an order of objects and relations) than an assemblage of practices in which future-oriented representations are cooperatively produced, negotiated and folded back into design.

**Historical perspectives on the imaginaries of genomics**

Lily Kay and Imaginaries and practices of the genetic code[[4]](#endnote-5)

Although, as the preceding review indicates, the concept of imaginaries has been deployed in studies of diverse technoscience fields, it has been especially prominent in STS work on the late twentieth-century and twenty-first century biosciences, particularly genomics. It is a conceptual pivot in Lily Kay’s (2000) lauded history of the key stages in the emergence of molecular biology as an informational technoscience during the period between 1957 and 1967. Kay traces ‘the gestalt switch to information thinking in biology, with all its paradoxes and aporias’ (p.xv). Discussing informational representations of the genome and the characterization of the genetic code as code and language, she refers to: ‘These culturally animated imaginaries’ (p.2).[[5]](#endnote-6) She uses, but does not directly discuss, the term imaginaries. Nevertheless, her account of poststructural approaches to ‘the genomic Book of Life’ effectively explains the interpretative framing associated with her use of the concept, as her following commentary indicates:

Thus, a poststructual approach to the genomic Book of Life is grounded in the conviction that once a commitment to a particular representation of life is made—material, discursive, and social—it assumes a kind of agency that both enables and constrains the thoughts and actions of biologists. In a sense, it is the representation itself that guides the imagination and reasoning, as was the case with the idioms of ‘information’ and ‘language’.... Thus from the poststructuralist perspective which informs this book, it is the writing itself that writes. Namely, once molecular biologists adopted the scriptural representations of the genetic code, once they committed themselves, consciously or not, to the information discourses and to the attendant analogies of genomic writing and reading, these representations became constitutive of the decoders’ reasoning: their work was shaped by the new biosemiotics of communication (p xviii).

Kay’s version of imaginary is defiantly poststructuralist/deconstructivist and linguistic. She underscores the hold of the powerful imaginary she traces, when she observes: ‘In fact, it is now hard to imagine that genes did not always transfer information or that there were other ways of knowing and doing’ (p.xv). Kay also identifies her history as ‘critique’, and she insists that the metaphorical and imaginative dimensions of genomic science are addressed, with all their ‘paradoxes and aporia’. She contends that genetic coding does not involve a ‘natural language’ and, that by foregrounding the features of the genomic imaginary, she is denaturalising the episteme and techne of this new life science.

Kay’s is the only full-blown history of technoscience project we have considered in our review. It is important for many reasons, not least of which its significance as a prime reference text, consulted and cited by many scholars studying the development of genomics. Hence, Kay has put the concept of imaginaries into the centre of historical research on this recent bioscience. In addition, although she does not address the term directly, Kay offered an exemplary account of how poststructuralist orientations have carried those setting out to analyse recent developments in the bioscience to the study of imaginaries. In reviewing Kay’s project, it is perhaps also appropriate to return to Jasanoff and Kim’s (2009) differentiation between STS and history of science approaches to imaginaries. For, despite their claim that the key distinguishing feature between such approaches is that history of science regards imaginaries as ‘individualised mental capacities’ this definitely does not apply in the case of Kay’s study in which she posits a fully social version of imaginaries.

**Feminist STS Imaginaries**

There has been a significant flourish of interest in the notion of imaginaries amongst feminist STS scholars since the start of the twenty-first century. The use of the concept itself has often been linked to feminist philosopher Michelle Le Doeuff’s explorations of what she designates as ‘the philosophical imaginary’. Both Helen Verran (1998) and Catherine Waldby (2000) cite this as influencing their adaptation of the term in their research-- in Verran’s case in her comparative study of the epistemologies of Australian aboriginals and that associated with Western science discussed above. In Waldby’s research, as registered previously, this entailed her coining of the term ‘biomedical imaginaries’. In addition, Susan Squier, in her study of *Liminal Lives* (2004) which she contends are features of contemporary biomedicine and literature, borrows Waldby’s notion of ‘biomedical imaginaries’, whilst noting the latter’s debt to Le Doeuff.

Haraway: storytelling, images, humour, gene fetishism and the ‘technoscientific unconscious’

Before exploring this particular genealogical thread, it is perhaps important to situate the deployment of the concept within the wider context of feminist STS. In so doing it is important once again to acknowledge the influence of Donna Haraway’s work. For, although she does not explicitly use the term ‘imaginaries’, Haraway has been an influential figure beckoning her readers to decipher the imaginative dimensions of technoscience. Perhaps more than any other STS researcher, she has dispersed the STS gaze, demonstrating the need to investigate the making and re-making 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.). So, for example, in both the *Cyborg Manifesto* ( 1985; 1991) and *Primate Visions* (1989) Haraway carried her investigations to a plethora of sites in which technoscience was being made.

Haraway’s foregrounding of story-telling as a key mode of modern science has been another key vehicle for her exploration of the imaginaries of technoscience which entailed a significant shift methodologically in STS practice. *Primate Visions* detected and examined the strands of story-telling that were woven into the twentieth-century science of primatology. Indeed, story-telling was the *leimotif* of this book. Life-stories of key figures in the field figured prominently, as did popular film narratives. Moreover, as outlined above, a further reflexive spin was added through Haraway’s use of science fiction to raise questions about her own story-telling about the making of this science and to encourage her readers to conjure alternative stories of this science.

Sampling bits of Haraway’s subsequent work suggests her resourceful engagement in the study of technoscience imaginaries. Following her trajectory in Chapter 4 of *Modest Witness*, for example, entitled ‘Gene: maps and portraits of life itself’, provides some indication of this. Haraway begins her study of modern genetics by examining the computer game, *Sim Life*, which she contends encourages its users to position themselves as ‘scientists within narratives of exploration, creation, discovery, imagination and intervention’ (Haraway 1997: 132). She comments that such narratives are deeply entangled with ‘Christian salvation history’ (Haraway 1997: 132). Once again, in analyzing modern technosciences— ICT and genomic science, in this case—she proposes that analysing narratives are crucial.

Haraway consistently draws attention to the imagery of modern technoscience and this is another vital mode in her exploration of the imaginaries of science. Hence, for example, this chapter of *Modest Witness* revolves around her readings of a set of visual texts (advertisements and cartoons) which represented modern genetics during the period of the launch of the Human Genome Project. This is accompanied by an examination of the trope of mapping– a visual trope which was central to the Human Genome Project.

This chapter shows Haraway considering the making and interpellation of ‘technoscientific subjects’ (Haraway 1997: 172) through the imaginary of genomics, during the completion of the Human Genome Project. She offers detailed analyses of the *SimLife* computer game, Niebart illustrated advertisements, Sidney Harris cartoons, New England Biolab and Logic General Corporation adverts. 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 provides a conceptual framing for her analysis by offering a bricolaged review, citing Marx’s and Luckác’s notions of commodity fetishism, Freud’s theories of fetishization, and Whitehead’s conception of ‘misplaced concreteness’ (Whitehead 1948; Haraway 1997: 146). This assemblage provides theoretical ballast for her empirical unpacking of the ‘corporealization and gene fetishism’ she regards as characteristic of the new life sciences.

Haraway discerns a ‘technoscience unconscious’ in operation in ‘the processes of formation of the technoscientific subject’ and she sets out to identify ‘the structures of pleasure and anxiety’ contributing to the formation and reproduction of the subject. She distinguishes her project from the practices of critique and deconstruction by reflectively insisting that she herself is implicated in the patterns and engaged by the processes she deciphers (Hawary 1997: 151). She emphasizes that she is concerned to trace ‘the pleasures of narrative and figuration’ (Haraway 1997: 169) associated with the life sciences emerging in the wake of the Human Genome Project.

Here and elsewhere in her work Haraway provokes her readers into considerations of the imaginaries of contemporary technoscience. For example, she observes wryly that: ‘The gene is the alpha and omega of the secular salvation drama of life itself (Haraway 1997: 133). Her adoption of the label ‘secular creationism’ in characterizing contemporary life sciences is both jarring and humorous: it disturbs perceptions of this technoscientific field as exclusively a domain of logic and rationality. Hence, she uses irreverent, challenging humour to draw attention to the imaginaries of contemporary genomics.

Haraway’s pursuit of the ‘technoscientific unconscious’ demonstrates that technoscience is not exclusively the domain of the rational. She highlights various moments in the continuous making and re-making of technsocience in dispersed, 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 and thereby implicated as technoscientific subjects through diverse practices and encounters. Moreover, she pointedly suggests that STS analysts are themselves not exempt from such interpellation. Nevertheless, Haraway does demonstrate that play, humour and shock may used in STS to help us to see the patterns of operation of contemporary technoscientific imaginaries.

José van Dijck: *Imagenation* and ‘theatres of representation’

Feminist STS has been particularly interested in the imaginary of modern genetics and genomics. A relatively early signal of this came with the publication of José van Dijck’s, *Imagenation: Popular Images of Genetics* (1998). Van Dijck examined ‘the role of images and imagination in popular representations of the new genetics since the late 1950s’ (p.3) and she coined the term ‘imagenation’ to identify the focus of her investigation. *Imagenation* offers a set of pictures of the ‘theatres of representation’ – four stages of ‘imagenation’-- which Van Dijck saw as constituting the various phases of the popular imagery associated with new human genetics from the 1950s to 1990s and the Human Genome Project which are outlined in the core chapters of the book (chapers 2 to 6). She tracks how genetics moves from being ‘a suspect branch of research into a thriving medical field’, although she insists that, across this time span, genetics ‘has been a continuous site of contestation’ (p.3). In analysing modern genetic science Van Dijck has adapted Katherine Hayles’s characterisation of science as a ‘theatre of representation’ (p.). The material selected for van Dijck’s study includes specific popular images, but her analysis concerns what she designates as ’imaginations’ which range from ‘biofears’ and ’biofantasies’ (ch.2), to notions of the gene as ‘master controller’ (p.91).

Catherine Waldby: the Visible Human Project and the’ biomedical imaginary’

The year 2000 saw the publication of two significant feminist technoscience studies which invoked the notion of imaginaries. One of these was Catherine Waldby’s examination of the VHP which followed her study of AIDS (1996) in which she had introduced the concept of ‘biomedical imagination’ which she linked to Michelle Le Doeuff’s (1989) notion of ‘philosophical imaginary’. Waldby provides a detailed explication of this strand of Le Doeuff’s theory. Bringing this together with Derrida’s discussion of metaphor, Waldby turns to 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’ (29). She maintained the pertinence of Le Doeuff’s ideas to the study of biomedicine, arguing: ‘the impossibility of sustaining a purely rational hermetic discourse’ (31). Waldby introduced her own term—‘biomedical imagination’ (p.5) -- and explained her interest in using it ‘in order to emphasise the speculative, “fictional” dimensions of the medical enterprise’ (p.16). Her encounter with Le Doueff’s notion of the philosophical imaginary led her to explain ‘biological imagination’ as follows:

At a general level this term refers to biomedicine’s speculative universe, its ways of proposing relationships and processes, of imagining the world according to its own requirements and interests. I have elected to use the term in order to stress its fantasising, imagic qualities, the qualities it is at greatest pains to repress. The aspect of this imagination which I focus on is the ways in which it imagines social order and its historical transformations, the ways that it converts these imaginings into the ‘technical’ language and imagery of science (p.31).

Waldby’s next major project was a study of the Visible Human Project (2000) and in this she does use the term ‘imaginary’, offering an explication of it and of her borrowings from Le Doueff. Like Le Doueff, Waldby begins with imagery – in her case, the imagery of Adam and Eve – from Genesis-- which she regarded as crucial in the VHP. Taking her cue from Le Doueff, she registers the significance 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. (136)

Hence, Waldby also follows Le Doueff in associating the imaginary with the excessive – that which ‘supplements’ the bare bones of the logic. Accordingly, she notes that the imaginary includes fantasy, myth, etc.

Writing at the cusp of the twenty-first century Waldby detects what she terms the operations of ‘IatroGenic desire’ (or ‘ Iatrogenic imagination’ (p.156)) as the predominant feature of the biomedical imaginary. Once again, she explains her terminology:

‘IatroGenic desire’ is my term for a kind of reaction formation to this instability [in the body] which can be located within medicine’s imagination. It is the desire to create, not disease, but rather kinds of bodies which are stable, self-identical entities rather than fields of perverse contingency. ... 114 IatroGenic desire is a kind of authorial desire in that it wants to ‘make up’ entities as acts of technical creation, through technically specifiable procedures which will produce reliable forms of life...., and attempts instead to substitute the reliability of commodity, reproduction, the replication of the same. As it circulates in the early twenty-first century, IatroGenic desire could be summarised as the desire for *programmable matter,* for a capacity to order materiality according to the algorithmic efficiencies of the computer. (pp. 113-14).

Within Waldby’s conceptualization, ‘IatroGenic desire’ thus ‘circulates at large in the fin-de-millennium biomedical imaginary’ (p.136) and she detects its operation in both the VHP and in the Human Genome Project. She provides detailed analysis of how this works, for example, in early twenty-first century biomedicine’s handling of the life and death distinction.

There are many aspects of Waldby’s engagement with the concept of imaginaries that are striking. First, despite her explicit discussion of the concept and her adaptation of Le Doeuff’s notion philosophical imaginary, she continues to use the term ‘biomedical imagination’ at various points, as if the terms were interchangeable. Secondly, her discussion of technoscientific imagery is intriguing. She posits that the need for legitimizing technoscience in the contemporary era might make the maintenance of canonical scientific meanings more difficult to enforce. However, this part of her analysis seems also to assume a clear distinction between the scientific and the ‘extra’ scientific. Thus, it is not clear where the excess comes from, given the social nature of language. More generally, iatrogenic desire becomes something of a super-human force, as Waldby writes about it at point as if it were a conscious, deliberate and extremely powerful human agent.

Franklin and the ‘genetic imaginary’

The first explicit deployment of the concept of ‘genetic imaginary’ came in Sarah Franklin’s contribution to the volume she wrote jointly with Celia Lury and Jackie Stacey -- *Global Natures/Global Cultures* (2000). Franklin provides a case study of a ‘one of the most popular Hollywood films ever produced’ (Franklin 2000: 198) -- *Jurassic Park* (1993 )-- and of its cultural off-shoots.[[6]](#endnote-7) 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’s complex analysis is presented as an examination of how the cultural phenomena (film, etc.) of *Jurassic Park* instantiate and represent the new genetic imaginary associated with the late-twentieth century bioscience of 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. This imaginary dimension of life itself is most evident in relation to the new genetics, and so I refer to it here as the *genetic imaginary* (Franklin 2000: 198).

For Franklin *Jurassic Park* provides rich material for a case-study of the enactments of the genetic imaginary. Indeed, she frequently characterizes *Jurassic Park* as ‘excessive’ (215).

One crucial feature of Franklin’s perception of the ‘genetic imaginary’ which can be discerned from her study 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).

The ‘public witnessing’ of the making and re-making of life as it is being ‘manufactured and marketed’ (p.216) in and through the new practices of the genomic biosciences, epitomized by the media attention given to the cloning of Dolly the Sheep and other late twentieth-century biotechnological developments, are highlighted by Franklin as part of the context for these break-downs.

Franklin ends her case-study with a rhetorical flourish, proposing that ‘in tracing the work of the genetic imaginary that an essential critical dimension can be added to the analysis of global culture, global nature’ (p.224). This ties her project into the general themes of the collectively-written volume in which it appears. But, more significantly for our purposes, it also proposes that the concept of ‘genetic imaginary’ is a critical tool. Indeed, Franklin maintains that examinations of ‘the imagery, narrative and consumption’ of *Jurassic Park* can ‘alert us to new registers of social practice’ and engage in the ‘charting’ of ‘new calibrations of foundational, naturalized categories, such as gender, kinship or species’ (224). She notes that her ‘argument’ and we might say, her deployment of the concept of ‘genetic imaginaries’ is, to use her own words, ‘in this sense [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’ (222). What is not clear from Franklin’s study is to what *extent Jurassic Park* is an exceptional manifestation of the genetic imaginary and, hence, whether the concept could be a tool which could, or should, be wielded more extensively in STS studies of recent configurations of the biosciences. Secondly, Franklin offers only broad hints about what gives the concept its critical edge. The suggestion seems to be that it can generate awareness of shifts in key social/political categories implicated in ‘a much wider set of orienting devices through which the world is both imagined and reproduced’ (222) realized in and through technoscientific change. The implication is that such awareness may potentially, although this is not made explicit, help us to consider the desirability of such an orientation and whether the world might be cast differently.

Stacey: genetic imaginaries and the cinema

Given Franklin’s collaboration with Jackie Stacey on the publication *Global Natures/Global Cultures*, it is not surprising to find links between Franklin’s coining of ‘genetic imaginaries’ and Stacey’s later study of key cinematic representations of genomics (2010). *The Cinematic Life of the Gene* (2010) is introduced by Stacey as an exploration of ‘the changing relationship between biological and cultural forms at the current conjuncture of science, feminism, and the cinema’ (x). This exploration takes the form of a collection of readings of cultural theories and six films, released between 1995 and 2005, which revolve around genomics and cloning. Stacey presents her project as centrally concerned with the genetic imaginary. She carves out her territory, beginning by pointing out that it links: ‘Interdisciplinary conceptual concerns with the ways in which a social imaginary combines psychic dynamics with cultural formations. ‘Continuing her explanation, she notes:

My starting point for thinking about the cinematic life of the gene is to interrogate how the genetic imaginary constitutes a set of very tangible anxieties surrounding the reconfiguration of the boundaries of the human body, the transferability of its informational components, and the imitative potentialities of geneticized modes of embodiment (Stacey 2010: 8)

Stacey offers he own definition of the concept of the genetic imaginary, relating it to the contemporary social era:

In this investigation, I define the genetic imaginary as the mise-en-scène of those anxieties, a fantasy landscape inhabited by artificial bodies that disturb the conventional teleologies of gender, reproduction, racialization, and heterosexual kinship. In the genetic imaginary, we see the invention of posthuman life forms whose histories can be manipulated and whose futures might be extended, but who threaten to exceed the controlling gaze of scientific technologies and thus continuously trouble their authority (Stacey 2010: 8).

Stacey lays out clearly what she sees as the distinctive promise of the concept-- its potential to bring ‘center frame the question of fantasy in debates about technical innovation’ (Stacey 2010: 8). Moreover, she both acknowledges the genealogical trails and resources that inform her use of the term and distinguishes her own from other deployments and understandings of it. Her genealogical mapping foregrounds the work of feminist technoscience studies researchers who have engaged with the imaginative significance of genomics, as she cites that of: José van Dijck (1995), Judith Roof (1997), Dorothy Nelkin and M. Susan Lindee (2009). Stacey registers, in particular, Donna Haraway’s (1997) use of notions of the ‘gene fetish’ and the ‘genetic unconscious’ as complementary to her own psychoanalytic take on the genetic imaginary. She acknowledges the influence of Sarah Franklin’s work with the concept, but claims that her own use of the notion differs from Franklin’s ‘in many ways’ (Stacey 2010: fn. 11).[[7]](#endnote-8)

Stacey’s study is aligned with and a contribution to feminist film and cultural theory and psychoanalytic theory, but she does also range more widely – engaging with a broad repertoire of other film and cultural theories. Organising her analysis around the genetic imaginary is presented as her way of getting at aspects of recent developments in the genetics which, in her estimation, have been rather neglected, as she explains:

With the notable exceptions of Roof’s (1996b) analysis of how changing notions of biological and cultural reproduction destabilize the foundations of the symbolic order, Sarah Kember’s (1998) exploration of the hopes and fears surrounding reproductive and information technologies, and Haraway’s work on gene fetishism, there is still very little work linking questions of desire, fantasy, and subjectivity to the study of the reconstitution of the body through genetic engineering, and there is almost none which brings psychoanalysis to bear on debates about how science produces particular cultural desires in this context (Haraway 1997, 131-72) (Stacey 2010: 9).

The terrain of ‘desire, fantasy, and subjectivity’ requires the tools of psychoanalysis in Stacey’s estimation. Hence, she endorses the distinctive version of imaginary which is informed by psychoanalytic theory and she regards this as distinct from other more generalized versions of the concept. She comments:

Throughout the book, the genetic imaginary refers to the organization of cultural fantasies in ways that are part of the psychic production of subjects. Although in cultural studies generally, the imaginary is sometimes used loosely and interchangeably with the concept of the cultural imagination and has thus become semidetached from its psychoanalytic origins, for this project the term still carries with it important traces of psychoanalytic thinking which remain central to my analysis. Unlike the imagination with its roots in philosophical and aesthetic conceptual traditions, the imaginary implies a set of structures for the production of subjectivities with the power to draw upon and reproduce emotional and unconscious attachments. While the imagination refers to patterns of emotional and artistic connectivity, the imaginary refers to the fears and desires organizing a particular repertoire of fantasies that have a deeper, often indirect, set of cultural investments and associations. (Stacey 2010: 10-11).

Stacey’s is a sophisticated cultural study, the details of which are beyond the remit of this essay. It is a crucial contribution to STS research with/on imaginaries for a number of reasons. It is part of a significant thread of feminist explorations of the genetic imaginaries which address the cultural resonances of and emotional responses to recent developments in this bioscience. An interest in the imaginaries of the recent biosciences resonates with the long-term engagement of feminists with issues of reproduction, sameness and difference, and sexual identity which are at the heart of these developments. The following comment is one example of how Stacey makes links to feminist tropes:

The genetic imaginary is haunted by the threat of a destructive and violent turn to sameness that robs culture of its reproductive motor, confirming the notion that only sexual difference connects the reproduction of life that flows between nature and culture. (34)

Another feature of Stacey’s work is that she is more explicit than any other commentators considered in this article about the importance of psychoanalytically informed uses of the concept. She marks these off clearly from what she calls ‘the philosophical/aesthetic’ tradition which we have seen other feminists (most notably through their use of Le Doeuff’s theory) draw on in their deployment of the term.

Finally, the quality and detail of Stacey’s study suggests the interdisciplinary dispersal of STS and is indicative of how diverse STS research on the imaginary has been. *The Cinematic Life of the Gene* has been a well-received, indeed prize-winning, film-studies text. It has had much less attention within STS. Nevertheless, this wide-ranging study of the cultural traces of the genetic imaginary, like much feminist research reviewed here, suggests that STS research requires cultural and interdisciplinary breadth and scope.

To date, the cluster of feminist work around imaginaries has garnered little attention. As suggested above, although she does not employ this specific concept, Haraway has been one of the most important figures in opening-up the terrain of imaginaries for STS exploration. There is evidence of this in her key works: in the foregrounding of story-telling, figuration, as well as in more specific conceptualizations, including gene-fetish and technoscientific unconscious. Her engagement with science fiction and her own use of humour and visual imagery extended the STS analytical and methodological repertoire. Haraway has repeatedly reminded her readers that, given that technoscience pervades C21 lives, STS must be concerned with the diverse and dispersed processes through which we engage imaginatively with technoscience and are made as C21 technoscientific subjects.

Other feminist STS scholars have followed in her wake and, as outlined above, a number of them have found explicit considerations of imaginaries fruitful in researching recent developments in the biosciences. Jose van Dijck’s was reviewed as an early – if not explicit-- example of feminist exploration of the imaginary of the genomics (in her case, of human genomics). But the work of Judith Roof, Evelyn Fox Keller and Sarah Kember is also affiliated with this trend within feminist STS. The preceding review highlights three contributions to feminist analyses of bioscience imaginaries: Sarah Franklin’s coining of the term ‘genetic imaginary’, Catherine Waldby’s notion of ‘biomedical imaginary’ and Jackie Stacey’s cinematic research on the ‘genetic imaginary’. In addition, we have noted, but not examined in detail, Susan Squier’s (2004) adoption of Waldy’s concept of ‘biomedical imaginary’ in her collection of case studies of the liminal lives she tracks in both key scientific and literary texts of the twentieth and twenty-first century.

There are commonalities and differences in this feminist research we have reviewed which merit further consideration. First, 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 part of the substance of the technoscience and hence, as meriting STS attention. Secondly, some are more concerned than others to use imaginaries in investigating subjectivity and subject formation. For example, Haraway’s notion of the ‘genomic unconscious’ indicates her interest in how subjects are formed in relation to a specific biotechnoscience. As Stacey emphasizes, her interest is not only in the aesthetic aspects of images and imagery, but in their significance in psychic dynamics and subjectivity. Overall, feminist research on imaginaries has generally been much more wide-ranging than other research deploying the concept: they have undertaken research on diverse cultural forms and been interested in the fantasies, hopes and fears engendered by recent technoscience, particularly by the life sciences and genomics.

It is Stacey who distinguishes between aesthetic and philosophical senses of the imaginary and psychoanalytic deployments of the concept. For her, it is important to maintain the distinction between the imaginary and the more commonplace use of the term. There is some validity to Stacey’s evaluation in that STS use of the imaginary linked to Le Doueff’s theory tends to emphasise the philosophical aspects of the imaginary. This is particularly evident in Waldby’s and Verran’s studies and we have noted above, that ‘imaginary’ and imagination are occasionally used interchangeably in Waldby’s work. Nevertheless, Le Doueff and Waldby certainly draw on the psychoanalytical tradition in formulating their takes on imaginaries. Overall, while there is some variation in degree of engagement, the cluster of feminist STS work on imaginaries has drawn more extensively on the psychoanalytic tradition than have other approaches considered in this article.

**THE TURN TO THE IMAGINARIES IN STS: WHAT’S IT ALL ABOUT?**

Having situated and mapped STS engagement with the concept of imaginaries, we are left to ponder what is at stake in this theoretical and methodological irruption within STS. If you have stayed with us thus far, the following reflections are offered by way of conclusion. Our comments are merely suggestive and they are offered to encourage further reflections -- as a form of invitation to other STS researchers to also consider what is going on in the recent interest in imaginaries.

The review provided in this article has shown that the pursuit of imaginaries within diverse projects is often presented as the vehicle for potential re-orientations of STS. Hence, for example, Marcus regarded the notion of imaginaries as a pivot in moving towards ‘distinctly cultural study of science’ (Marcus 1995: 3)—in that it was, in his estimation, a useful theoretical concept which enabled and encouraged explorations of the tensions between discourses and practices. Offering a parallel but distinct vision, Hyysalo (2006) advocated a focus on imaginaries as a way of inculcating more sensitivity in the analysis of technoscientific *practices,* replacing the preoccupation with technology (as hardware, etc.) in much STS. Jasanoff and Kim (2009) expounded on the importance of STS casting its investigative vision beyond professional scientific actors and communities in order to investigate national cultures of technoscience and, for them, technoscientific imaginaries was the key theoretical tool in facilitating that move. For other STS researchers, the concept became the lynchpin in their ambitions for STS and its practitioners. Joan Fujimura (2003) advocates the use of ‘imaginaries’ in forging ‘sociologies of the future’. In contrast, Kim Fortun and Mike Fortun’s (2005) vision was more specifically ethically and methodologically orientated as they pursued how a recasting of imaginaries might contribute to a new ‘civic science’ of toxicology and an STS ‘ethics and friendship with the sciences’.

In general, recent STS research on imaginaries has 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 increasingly includes research on aesthetics, values and emotions—as crucial dimensions in the study of science and technology. Likewise, whereas science and technology were formerly generally regarded as the domains of facts and artefacts, they are now as likely to be associated with storytelling, imaging, and imagining.

Beyond strategic, methodological and ethical reorientations of the field, imaginaries often come into the picture when there is an interest in the normative aspects of technoscience. In this regard, it is important to register how STS has been transformed by feminist and postcolonial scholarship. These movements have challenged assumptions about science as a value neutral domain and they have enriched the field with critical studies of how modern Western science has been shaped by and embodies gendered and colonial and post-colonial power relations. Feminist and postcolonial scholarship has made the study of values an acceptable part of STS research.

But the concept of imaginaries also entails a more specific theoretical shift. Discussions of values within technoscience were previously often handled through reference to ‘interests’ and/or ‘ideology’. Strikingly ‘interests’ and ‘ideology’ have proved to be limited theoretical tools in pursuing the normative dimensions of science. In the first instance, they both operate only on a cognitive register – neglecting affective dimensions (which have pervaded every avenue of social research in recent years). Moreover, both are linked to distortion, misrepresentation and manipulation, whereas invoking the imaginary allows for the productive and unconscious and it is these dimensions of technoscience and medicine which have attracted attention recently.

In this sense, the circulation of the concept of imaginaries marks the relative decline in the deployment of ideology in STS research.[[8]](#endnote-9) The concept of ideology has always been a difficult one for social and political analysts, not least because, as previously indicated, it is haunted by notions of error, distortion, misrepresentation, and false consciousness. This is despite the fact that the Lukacsian tradition encouraged a more complex, less bifurcated, understanding of the concept. Taylor considered the relation between ideology and the social imaginary, and noted that the social imaginary could designate elements traditionally associated with ‘a distorted or false consciousness’ of a situation – which he associates with ideology. However, crucially he observed that it also embraced ‘what we imagine can be something new, constructive, opening new possibilities’ (Taylor 2004: 183).

Relatedly, in a published interview, Donna Haraway has contended that there is a need for precision in the use of the term ‘ideology’, as she explains :

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.  The fantastic has to do with psychodynamic processes that play themselves out in culture as well as individually.  The ideological has to do with a kind of Marxist sense of ideology and follows ideas of representation and misrepresentation of social interests.  At least that's one good definition of ideology.  And the mythological has to do with these deep implications in narrative and storytelling practices and inhabiting stories.  So the three have to do with each other but are not reducible to each other.  They do different kinds of meaning work (Haraway 2000: pp.77-78).

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. In this regard STS follows on the tail of these trends.

However, what might seem *de rigour* in cultural studies is much more fraught in STS. In this regard it is helpful to return to Verran’s, Squier’s and Waldby’s assessments that the denial of imaginaries has been a crucial feature of Western science. The pull towards reassembling clear demarcations between fact and fiction or fact and fantasy in STS is still strong. STS’s uneasy relationship to science fiction is an obvious manifestation of this. We have also noted that Haraway presents some of her research on recent developments in the biosciences as probing the ‘unconscious’ of genomic science. Acknowledging these difficulties around STS thus also brings us to questions about what tools are available for analysing the imaginaries of technoscience. Given that imaginaries are far-reaching social phenomena, it may take something other than the conventional techniques of exposition and argument to conjure its features. Thus, it is not surprising that Haraway experiments with the form of her texts. While she does not completely abandon the conventions of STS exposition, she has dabbled with humour, shock, as well as endorsing and playing with science fiction herself.

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 science fiction as resources in the investigation of scientific imaginaries. Imaginaries have often been neatly packaged in STS work: national technoscientific imaginaries, imaginaries of publics, etc. However, there has not been much investigation of how they actually work. For example, in Fortun and Fortun’s (2005) examination of subject formation – they refer back to Traweek’s (1998) early work on the careers and identities of physicists, rather than offering their own analysis of subject formation.

In a recent keynote address at 4S, Steve Shapin (2012) declared subjectivity as the new challenge for STS. Of course, Shapin’s failure to acknowledge recent feminist STS work infuriated many. However, there is an unease about bringing subjectivity and certainly fantasy into the analysis of technoscience. STS engagement with the concept of imaginaries may provide an entry onto that terrain. However, if this is to occur, there would need to be more awareness of and recourse to the diverse repertoires through which the concept has emerged. There will also have to be further interrogation of the adherence to the fact- value distinction and the positioning of STS in relation to fantasy, the unconscious, etc.

In situating our own project within STS there is much that could be said. However, we will restrict our comments to just a few issues. One is to note that there are obvious resonances between STS explorations of imaginaries and the ‘sociology of expectations’ (Brown and Michael ; ; Pieri ) which we have not addressed explicitly here. Both revolve around the examination of social (including emotional) investments in technoscience. However, the sociology of expectations is much more specifically concerned with the conjuring of prospects for the future (including commercial prospects), in this sense, it is about the potential outcomes and deliverables of technoscience. Hence, although it is not packaged this way, it offers a very channeled and specific cut on the imaginaries of technoscience, often designed to orientate science policy or, in some cases, to caution against hype and disappointment about technoscientific innovation. In contrast, as the review provided above suggests, STS research centred on imaginaries has been much more wide-ranging. It spans orientations to the past, present and future and in its examinations is much more likely to yield detailed accounts of fears and hopes. Hence, STS investigations of imaginaries, in contrast with the sociology of expectations, has not been concerned primarily with what technoscience delivers in terms of commercial or other specific benefits (cures, inventions, etc.). As the preceding analysis also highlights, STS research on imaginaries has been much more interdisciplinary in its theoretical borrowings and methodological orientations than the sociology of expectations.

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. As noted above, we have deliberately beem inclusive both in our sampling of STS research in this area and in reviewing resources for such work. We have been impressed by the spread and diversity of STS scholarship which pivots on notions of imaginaries. However, we have also been struck by the limited range of exploration of genealogical resources that have been tapped in these STS ventures. Our investigation has brought us up against the question of what counts as STS and generated concern about some policing of disciplinary boundaries within STS itself – or at least failure to acknowledge the many flowers blooming in this colourful field.

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1. The group which worked on this project included four members of the Center for Transcultural Studies (CTS)— ‘a Chicago-based not-for-profit research network with close links to the *Public Culture* editorial collective’. These were: Benjamin Lee, Charles Taylor, Michael Warner and Dilip Parameshwar Gaonka. They originally met in the summer of 1999 ‘to draft a statement on *new imaginaries’* (Gaonkar 2002: pp. 1, 2). Some of the key ideas highlighted in this statement will be discussed later in this article. As noted above, their deliberations were launched through a primary engagement with the work of Cornelius Castoriadis and particularly with his influential text, *The Imaginary Institution of Society* (1987). [↑](#endnote-ref-2)
2. We have noted, for example, that in their review of STS work on genomics and sociotechnical futures, Adam Hedgecoe and Paul Martin considered only ‘sociological’ contributions to the field ( Hegecoe and Martin 2008). [↑](#endnote-ref-3)
3. The article appears in Goodman, Heath and Lindee (eds) Genetic Nature/Culture: Anthropology and Science Beyond the Two-Culture Divide (2003). In addition, Fujimura cites key anthropological theorists in her study, most notably Appadurai. [↑](#endnote-ref-4)
4. The title of Chapter 1 of Kay’s *Who Wrote the Book of Life? A History of the Genetic Code* (2000) is ‘The Genetic Code: Imaginaries and Practices’. [↑](#endnote-ref-5)
5. See also: This discourse [the information discourse] linked the biosemiotics of molecular biology to the imaginaries of postwar technoculture (Kay 2000: 30). Indeed, it was the information catachresis—the double metaphorical construction of information – that seemed to validate the representations of the genetic code as natural, eternal and universal writing. It is the space created by these slippages, ambiguities, paradoxes, and loss of referentialities that served as a repository for the scientific imaginary of the genomic Book of Life (34). See also p. 327. [↑](#endnote-ref-6)
6. Jurassic Park was directed by Steven Spielberg and based on a Michael Chrichton novel. As Franklin outlines, it was an intensely anticipated, ‘record-breaking box office earner’, with striking visual effects and was embedded in ‘commercial infrastructures through which it was marketed, brandnamed, packaged and consumed’ (198). Its narrative involves the recovery of extinct dinosaurs by genetic engineers through their uncovering of fossilised DNA. [↑](#endnote-ref-7)
7. Although Stacey does not delineate what she sees as the key distinctions between her approach and that of Franklin, it is obvious that Stacey’s endorsement of a psychoanalytic approach to genetic imaginaries is crucial. [↑](#endnote-ref-8)
8. Although, some STS researchers, including some considered in this article, do use the concept, alongside the notion of imaginaries. [↑](#endnote-ref-9)