# **Imaginaries in Science and Technology Studies (MM draft outline 21/3/11)**

## **William Gibson’s ‘The Gernback Contiuum’ (1994)**

“The Gernsback Continuum”, William Gibson”s first professional publication in 1981[[1]](#endnote-2), is a self-conscious evocation / exploration of the circuitous mediated travel of scientific imaginaries, as well as a somewhat expansive gesture towards the historical contingencies that reshape and redirect such imaginaries. This short story is a first person account of the haunting of a professional photographer by an imagined future that never came to be. To clarify, the story is set in the 1980s and the photographer experiences the “semiotic ghosts” of what his pop-art historian client – Dialta Downes – calls: “a kind of alternate America: a 1980s that never happened. An architecture of broken dreams.” (Gibson, 1994: 5). His assignment is to assemble a portfolio of architectural photography for a coffee-table illustrated history of American architecture of the 1930s that will be sold to British consumers, who are figured by the narrator as obsessive about: “the more baroque elements of American pop culture” (Gibson, 1994: 2).

In the course of the assignment he experiences a number of incidents when the future that never was crosses over into his everyday existence. Initially he sees: “a twelve-engined thing like a bloated boomerang, all wing, thrumming its way east with an elephantine grace, so low that I could count the rivets in its dull silver skin, and hear – maybe – the echo of jazz”(Gibson, 1994: 5). Later, after sleeping on a lengthy discussion about the theoretical causes of his vision with a free-lance journalist friend, he sees an entire inhabited city complete with “gleaming ziggurat steps”, “roads of crystal”, “giant wing-liners, little darting silver things …” culminating in his sight of “them”:

They were blond … He had his arm around her waist and was gesturing toward the city. They were both in white: loose clothing, bare legs, spotless white sunshoes … He was saying something wise and strong, and she was nodding … They were the children of Dialta Downes's ‘80s-that-wasn’t; they were Heirs to the Dream. They were white, blond, and they probably had blue eyes … They were smug, happy, and utterly content with themselves and their world. And in the Dream, it was *their* world (Gibson, 1994: 9).

Gibson’s narrator is no longer worried about his sanity. He is now convinced that what he has witnessed is the ghost of a dream city “thrown up out of the collective yearning of an era” (Gibson, 1994: 9). The choice of verb for the erection of the dream city is salient, as the narrator’s fear is abject in the face of this totalitarian future that might have been, but which has not come to pass because: “the rockets on the covers of the Gernsback pulps had fallen on London in the dead of night , screaming” (Gibson, 1994: 5) and the American Dream has been derailed by consciousness of: “pollution, the finite bounds of fossil fuel, of foreign wars it was possible to lose” (Gibson, 1994: 9). Gibson’s phrase “collective yearning” captures well, for me, the sense of the imaginary as something that can never be grasped but which is intensely desired, whilst his detailed description of the architecture, transportation, eating habits and bodily comportment configured by the “semiotic ghost” captures the sense that an “imaginary” or “imaginaries” encompass whole ways of life, fantasised social worlds, and not just isolable technoscientific mcguffins. However, contra one potential reading of this story, I don’t think it is essential to such total visions that they are totalitarian. There is the sense, in the story, that this collective yearning was hegemonic at a particular historical moment, but the prescription offered the narrator by his journalist friend: “Really bad media can exorcise your semiotic ghosts” hints that imaginaries, or collective yearning can never fully exclude residual or emergent alternatives.

The story is perhaps a little heavy-handed in making its point, but in its account of the circuit of visual and textual discourses through the creative industries and hence through popular culture – and material culture in the form of built architecture and industrial design – the potential causes of the narrator’s (perhaps) hallucinatory visions are well-delineated. The link with science fiction is underscored – apart from in the story’s title – by references to, for example: “a dozen shots of Frank Lloyd Wright’s Johnson’s Wax Building, juxtaposed with the covers of old *Amazing Stories* pulps, by an artist named Frank R. Paul; the employees of Johnson’s Wax must have felt as though they were walking into one of Paul’s spray-paint pulp utopias” (Gibson, 1994: 3). Or, for those for whom the pulp reference doesn’t signify, but who might have viewed sf outside the fan context, he asserts: “they put Ming the Merciless in charge of designing California gas stations. Favouring the architecture of his native Mongo, he cruised up and down the coast erecting raygun emplacements in white stucco. Lots of them featured superfluous central towers ringed with those strange radiator flanges that were a signature motif of the style, and made them look as though they might generate potent bursts of raw technological enthusiasm, if you could only find the switch that turned them on” (Gibson: 1994: 4).

The reference to a character from *Flash Gordon* is a highly condensed signifier. *Flash Gordon* was the eponymous hero of a comic strip that first appeared in 1934 continuing until 2003. As the *Encyclopedia of Science Fiction* points out: “The *FG* comic strip has had many repercussions in other media. It led to a popular radio serial, to a short-lived pulp magazine … and in the late 1930s to several film serials starring Buster Crabbe; later came a tv series and a film. A full-length film parody, *Flesh Gordon*, appeared in 1974” (Clute, J. and Nicholls, P. 1995: 433). Further there was a, somewhat camp 1980 remake of the movie that was very successful at the box offices in the UK and the USA, recirculating Ming the Merciless for a new generation, and sending up the “sinister fruitiness”[[2]](#endnote-3) that Gibson characterises the dream city as embodying. According to the *Encyclopedia of Science Fiction*: “the three *FG* film serials continue to have a cult following and are regularly revived on tv and in the cinema”. Significantly, they don’t say *where* they are regularly revived. This interjection by Clute and Nicholls[[3]](#endnote-4), in the Introduction makes the point that I think is hinted at by the lack of geographical specificity in the quote I’ve singled out:

In this second edition, to a greater degree than in the first, most of the writing – perhaps 85% - is by Clute, Nicholls and Stableford, who despite small disagreements have displayed a critical consensus over a strikingly large range of issues. This means, for good or ill, that the book has a more unified tone of voice than most reference books (whose editors often write only a small proportion of the text themselves). We should point out, remembering charges of Anglophilia made of the first edition by a vocal minority, that only Stableford is English. Clute is Canadian and Nicholls Australian, and both have spent some years in the USA, whose culture they regard as adoptively an important part of what they are, and central to what sf is (Clute, J. and Nicholls, P. 1995: viii).

Like Gibson’s narrator who accepts his commission in London, and then cruises around California and Arizona to fulfil it, Clute et al refer to a shared Anglophone – but not Anglophilic! – repertoire of cultural references that we might think of as a science fiction imaginary. But it is important to note that the traffic is not simply between the English-speaking nations. Gibson also refers to books on Thirties design, one of which: “contained sketches of an idealized city that drew on *Metropolis* and *Things to Come*” (Gibson, 1994: 8), the former perhaps the archetypal science fiction film, released in its country of production, Germany, in 1926 and in the UK and the USA the following year; the latter according – once more – to the Encyclopedia of Science Fiction: “the most expensive and ambitious sf film of the 1930s – and, despite the growth of magazine sf over the next 15 years, the last sf film of any importance until the 1950s. *Things to Come* (1936) based on H.G. Wells’ novel of the same name was made in the UK but its director was an Oscar-winning Hollywood production designer.

Gibson’s story thus hints at the porosity of national and transnational imaginaries, however – temporarily – imperialising they appear to be. It also explicitly invokes the notion of a mass unconscious that is resourced by fantastic, and sometimes commodified, iconography, as well as by individual experiments with altered states. Merv Kihn, “free-lance journalist with an extensive line in Texas pterodactyls, redneck UFO contactees, bush-league Loch Ness monsters, and the Top Ten conspiracy theories in the loonier reaches of the American mass mind” says: “Look, I’m sure you’ve taken your share of drugs, right? How many people survived the Sixties in California without having the odd hallucination? All those nights when you discovered that whole armies of Disney technicians had been employed to weave animated holograms of Egyptian hieroglyphics into the fabric of your jeans, say …” (Gibson 1994: 6).

**Introduction: imaginaries in science fiction, science, and STS**

Given William Gibson’s status as a leading contemporary figure in science fiction (SF), it is not surprising that ‘The Gernsback Continuum’ offers an exploration of technoscientific imaginaries. This article investigates another set of explorations of technoscientific imaginaries: those which have recently featured in science and technology studies (STS). While the pursuit of imaginaries has been the mainstay of SF, such undertakings have been far less common in STS. As some STS researchers whose work is examined below highlight, outside of science fiction, there has been considerable resistance to the linking of science with any aspect of the imaginary. In the introduction to a set of case-studies of the imaginaries of biomedicine Susan Squier notes: ‘the strictly regulated contexts of the scientific media’ and their refusal to acknowledge ‘their debt to the imaginary, the speculative’ (2004:15). Although Squier’s assessment may be controversial, it does signal the difficulties in tackling imaginaries in science. We will return to these difficulties later in this article.

Nevertheless, as we document below, there is increasing evidence that science and technology studies (STS) researchers have been making technoscience imaginaries their concern as well. This article investigates the use of the concept of imaginaries in STS. As STS practitioners, our general goal was to generate more theoretical and methodological self-consciousness and debate around the usages of imaginaries within STS. Thus, we were interested not only in tracing the deployment of the concept in STS, but also in considering the background and significance of this development. We quickly recognised that there would be many strands to this project, involving: documentary, etymological, genealogical, and conceptual research and analysis.

In laying out the strands of our pursuit of imaginaries within STS we cannot avoid the question of what the term ‘imaginaries’ means or designates. Since one of the most important trajectories of our investigation was ascertaining differences in and nuances of meaning in specific (particularly STS) usages, variations in these will emerge in the analysis which follows. Nevertheless, without pre-empting that discussion, we would note that our own working definition of the term was attuned to Michelle LeDoeff’s formulation: ‘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’ (from Waldby 2000: 137 quoted in Squier 2004: 14).

The article is structured rather like a collage, representing both the various strands of our investigation of the concept of imaginaries within STS and bits of the picture of the complex terrain in which this usage is situated. The figures supplement this, providing different sorts of representations of the terrain of the concept. We began with the established playground of scientific imaginaries-- science fiction. In the next section we undertake a limited citation analysis exercise to identify key examples of STS use of the concept.—this is the material which prompted this project and around which it is orientated. We then step back to situate this work in a wider context, beginning with the etymology of the term itself, commenting on some aspects of the evolution of the term relevant to its use in STS. From there we move on to provide a statistical overview of the use of the concept and again we offer some reflections on patterns identified in this exercise. The penultimate section proposes a typology – a pattern of clustering in approaches to imaginaries in STS. We conclude with some reflections about the emergence of this conceptual turn in STS.

## **Imaginary: STS citations and case-studies**

Turning from SF to STS, we begin with the results of a search of the peer-reviewed literature published in recognized STS and allied journals. Searching for the keywords ‘imaginary’ and ‘imaginaries’ returned 117 articles published between 1993 to 2009.[[4]](#footnote-2) Without analysing in detail each of these articles, it is not possible to say how these concepts are put to use although given the large number of hits from the journal *Configurations*, it might be safe to conclude that imaginary and imagination in this context is understood with reference to the making, circulation and consumption of cultural representations of science and technology. To refine the search,we identified only those articles that used the concepts of imaginary/ies in their titles. The assumption here was that if they appeared in the actual titles then it was likely that the authors regarded this concept as crucial to the analysis and would therefore have given it considered treatment. Using this approach led us to identify six articles published in the last 13 years.[[5]](#footnote-3) These articles will be examined in more detail below. We might note here that most of these articles specify and address different kinds of imaginaries in their work: sociotechnical imaginaries, practice-bound imaginaries, scientific imaginaries and geographic imaginaries, each of which are developed with reference to specific cases with which these authors are concerned. This specification will also be given further consideration below. Moreover, it is clear that, while engaged in diverse fields of research from artificial intelligence, nuclear power, agriculture, elderly people’s use of novel technologies, toxicology to clinical genetic testing, these authors are also exploring what constitutes the imaginary in these articles.

Of course these key articles are not the only markers of the emergence of ‘imaginaries’ as a conceptual node in STS work. There have been some notable book-length projects which have employed the concept. George Marcus’s edited collection, *Technoscientific imaginaries: conversations, profiles, and memoirs* (1995), also discussed below, is another significant reference point. In addition, Catherine Walby’s (1996) study of AIDS and her later examination of the Visible Human Project (2000) both revolved around her adaptation of Michelle LeDoeff’s notion of the ‘philosophical imaginary’ into the concept of the ‘biomedical imaginary’. Of course, more ephemeral and difficult to track evidence could no doubt be found if we had documented lectures, seminars, conference panels and papers.

Our basic citation search has provided us with the core material for our project.[[6]](#endnote-5) We have also reviewed the references in these articles and used this to supplement the citation index list (adding Suchman and Bishop 2000). Our list was also extended to include the books mentioned above. We return to this STS literature later in the article. However, at this point, it is helpful to consider some features of the etymology of the concept itself.

**Imaginaries: some etymological tracing**

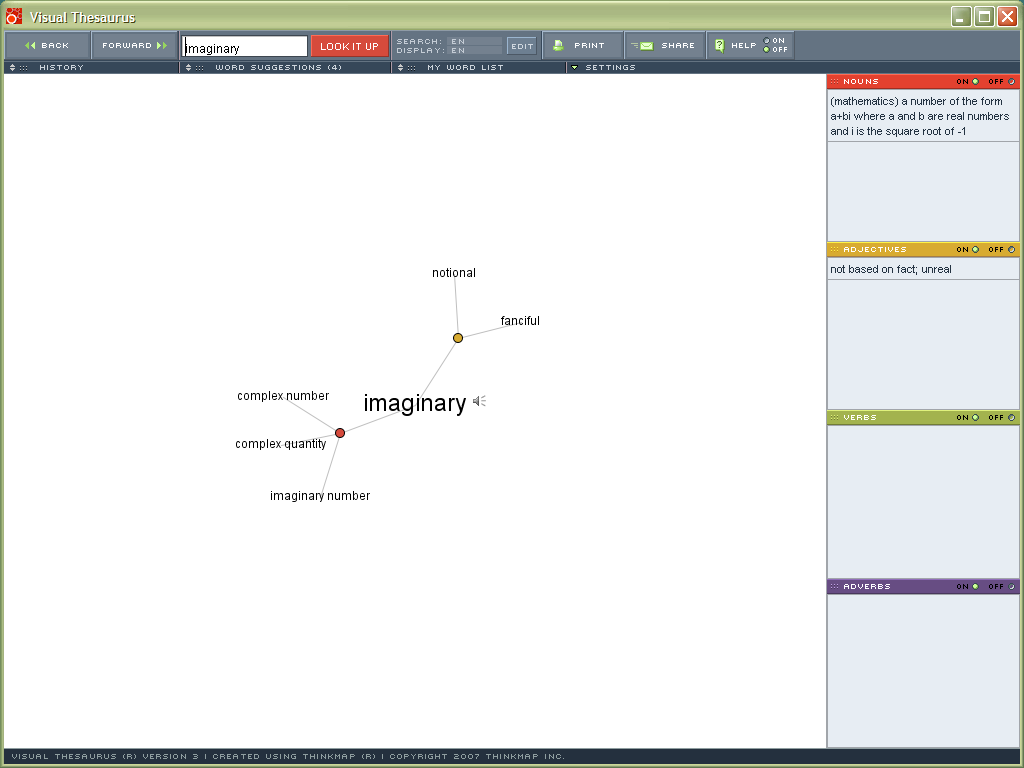
As one might expect, ‘imaginary’ is strongly related to the term ‘imagination’. It is used mostly as an adjective and less frequently as a noun. In the OED, we see that its adjectival form reveals considerable variation and richness for describing objects of the imagination, denoting:

* that which exists only in the imagination (1425+);
* that which relates to the imagination (1500+);
* that which relates to the nature of images or representations (+1594), and
* that which can be imagined (1624+) or supposed (1631+).

However, another adjectival form is reserved for quantities or properties that have no real existence. For example, in mathematics, imaginary is used as a descriptor in two ways to refer to:

* that which passes through a series of points to make a line, circle, etc., which otherwise has no real existence (1541+) and;
* that which designates the quantity of a *complex* or *impossible* number (1670+).

In terms of its nominal function, the imaginary describes three kinds of objects or persons: (1) a Roman officer who carries the image of the emperor (1460+); (2) an imagination (1594+); and (3) an imaginary quantity or expression in mathematics (1768+). The visualisation below gives a crude sense of the distribution of synonyms (taken from Dictionary.com) giving only the noun-forms used in mathematics.



If we consider how the concept, the imaginary, is used in contemporary STS literature, we could say with some degree of imprecision that it refers to a domain or order of objects and relations, which is to say that the imaginary is *something imagined by a collective*. The fact that it is often collocated with the term ‘social’ implies a subtle repetition to stress its collective basis. So the question we ought to ask is: how did imaginary come to express an order of things or relations? How did it form part of the vocabularies of a counter-discourse on science and technology? What are its conditions of emergence? Perhaps a good place to look for this mutation is in the noun forms of ‘imaginary’. Consider the following samples taken from the OED:

**2.** An imagination; a fancy; something imagined. Freq. in *pl.*

**1594** [S. DANIEL](http://dictionary.oed.com/help/bib/oed2-d.html) *Delia* (new ed.) xlix. sig. E1, Cease dreames, th' imaginary [**1592** th'ymagery] of our day desires, To modell forth the passions of the morrow. **1612** [G. CHAPMAN](http://dictionary.oed.com/help/bib/oed2-c2.html) tr. Petrarch *Seven Penitentiall Psalms* 83 (*title*), To yong imaginaries in knowledge. **1710** [D. MANLEY](http://dictionary.oed.com/help/bib/oed2-m.html) *Mem. Europe* I. III. 272 False glittering Imaginaries. **1747** [S. RICHARDSON](http://dictionary.oed.com/help/bib/oed2-r.html) *Clarissa* I. xxxi. 201 And Cowley thus addresses Beauty as a mere imaginary. **1747** [S. RICHARDSON](http://dictionary.oed.com/help/bib/oed2-r.html) *Clarissa* II. xiii. 73 The lovers *imaginaries* (Her own word! Notable enough! i'n't it?) are by that time gone off. **1961** C. BUKOWSKI *Let.* *c*15 Jan. in C. Bukowski & S. Martinelli *Beerspit Night & Cursing* (2001) 167 You dedicate Ern[ie] with imaginaries (some anyhow) when he is near, but distance breaks the spell. **1999** *Earth Matters* (Friends of the Earth) Summer 36/3 Such ‘imaginaries’ are crucial because they shape urban development patterns.

There are three things worth noting here. First, imaginary is often pluralised when used in noun form to express objects of thought, imagination or desire. Second, we notice that the term is used in poetry and personal accounts, which suggests a genre of introspection, reflection or affective writing. Third, in nearly all the examples cited above, imaginary is some thing produced by, or ascribed to, an individual. There is no sense that imaginaries are a collective process, except in the last example: ‘Such ‘imaginaries’ are crucial because they shape urban development patterns.’ (*Earth Matters*, 1999). It is unclear to whom the ‘imaginaries’ belong but it would seem unlikely that they belong to an individual. The source cited here is *Friends of the Earth* the registered UK campaigning environmental organisation . Hence, the reference here is to a counter-discourse engaged with issues of science, technology and environmental policy. A closer inspection of the clause shows that the term ‘imaginaries’ forms part of a construction known as a ‘nominalisation’ – i.e., adjectives are transformed into nouns – thereby allowing abstract processes to become grammatical agents. Here we see the plural form of imaginary acting on ‘urban development patterns’ which, I would argue, approximates the modern concept we are investigating.

[I think this concluding set of reflections is good, could be redrafted a bit to highlight: the significance of nominalisation, the issue of individual vs collective and some of the issues raised in the pargraph above (If we consider…) that I suggested you move down here. This includes the addition of ‘social’, which is superfluous, but which is a bit like Latour and Woolgar’s use of it in their early additions of Laboratory Lives. This section has to be carefully framed so that it doesn’t assume analysis which will be provided elsewhere. I think that the next paragraph is really good and really important. ]

Unfortunately, an etymology cannot tell us how or why this transformation took place; it can only provide symptoms of denotation and syntax. It cannot tell us how the plural form of imaginary became the property of a collective, how it became inserted within a counter-political discourse, or how it acquired agency over complex socio-political processes. We will need to look for references beyond conventional dictionaries to find some answers to these questions.

## **Genealogical tracings and reflections**

### The differences between imagination and imaginary

There are many strands of the genealogy of imaginary that could be explored for their potential relevance to STS One thread that could be considered is the relation between imagination and imaginary. The chart below indicates that they have some relation, but imaginary diverges from imagination, probably because the latter is understood as a faculty or psychological capacity. One genealogical question raised here is concerns how this divergence took place. We can see one version of the divergence in the usage of the terms in academic literature:

|  |  |  |  |
| --- | --- | --- | --- |
| **1945-2010** | **Document type** | **Title** | **Topic/keyword** |
| “imagination” | Article | 9807 | 13053 |
| “imaginary/ies” | Article | 4661 | **19121** |
| “imagination” | Book | 3901 | 5409 |
| “imaginary/ies” | Book | 878 | 4324 |
| “imagination” and “imaginary” | Book | 30 | 136 |
| “imagination” and “imaginary” | Article | 20 | 162 |

What can we say on the basis of these numbers? What do they tell us about the way in the imaginary has developed as a concept distinct from imagination? In most respects, the 'imagination'' outweighs 'imaginaries' or the 'imaginary.' Does that mean that imagination is more important than imaginaries? I think it is possible to say that it moves more widely across the disciplines, but it is difficult to say for sure overall. For instance, there are more mentions of 'imaginary/ies' in the keywords and abstracts of articles than there are of 'imagination', possibly meaning that imaginaries are invoked more often, even if they don't make it into the title of the articles. We might say that the imaginary is less substantive than the imagination. On the hand, as the last two rows of the table show, they are hardly ever used together. It is as if they are too close to each other to be mentioned together. Does this mean they are competing with each other, that they don't co-habit very comfortably? Genealogically, this is interesting. They are very close, but their kinship also means they have to be kept apart.

As a concept, how do the imaginary compare to other social keywords? What weight does the imaginar carry compared with other major concepts such as ideology, commodity or spectacle or materiality? Just restricting this to academic articles, here are some points of comparison:

|  |  |  |
| --- | --- | --- |
| **1945-2010** | **Document type** | **Topic** |
| materiality/ies | Article | 1068 |
| commodity/ies | Article | 14702 |
| imaginary/ies | Article | 19121 |
| identity/ies | Article | 28062 |
| ideology/ies | Article | 37567 |

At a rough estimate, the imaginary comes somewhere between commodity and identity in terms of how often it is invoked. This suggests that it is a term of some importance, certainly not a relatively specialist term like 'materiality' would seem to be, but one that bears substantial value.

It is also interesting to consider the pattern of the currency of the concept of 'imaginaries' in academic literature. This provides background to the review of STS journal publications offered above. The figures in the bargraph presented belowsuggest some interesting genealogical patterns:

There is very little mention of imaginaries before the mid-1950s. One possible explanation of the emergence of the concept at this time would be the publication of Jean-Paul Sartre's *L'Imaginaire: Psychologie phénoménologique de l'imagination* (Paris: Gallimard, 1940), but further investigation would be required to substantiate this. Secondly, a growth in number of publications that use the term 'imaginary' is notable in the early 1970s, then in the 1990s and especially, since 2010. Of course, to some extent, the increasing numbers of publications simply reflects the growth of academic publishing, particularly the increased number of journals.. However, even allowing for this, there are some variations in the growth of imaginaries that may be genealogically interesting. Interest in the imaginary seems to run through 1950-1960s, but to increase notably in the mid-1970s. Growth is relatively constant through the 1980s, although which a significant collapse in the late 1980s. Against continuing growth overall, there are years after 2000 when publication drops away markedly, but with a strong resurgence of interest in the last few years.

Illustration : 1945-2010: 'imaginary/ies as article keyword'

As an examination of journal publishing patterns indicates,he use of the term ranges widely across academic fields.. From *Arbeiten aus Anglistik und Amerikanistik* to *Zygon,* around 1500 different journals have published work that refers to imaginaries. The list below shows the top 20 journals in the years 1945-2010:

|  |  |
| --- | --- |
| 1. *studi francesi* | 44 |
| 1. *tls-the times literary supplement* | 42 |
| 1. *french studies* | 36 |
| 1. *revue d histoire litteraire de la France* | 35 |
| 1. *quinzaine litteraire* | 34 |
| 1. *europe-revue litteraire mensuelle* | 33 |
| 1. *rlc-revue de litterature comparee* | 24 |
| 1. *new york times book review* | 23 |
| 1. *revue francaise de psychoanalyse* | 22 |
| 1. *esprit* | 21 |
| 1. *french review* | 21 |
| 1. *connaissance des arts* | 20 |
| 1. *evolution psychiatrique* | 20 |
| 1. *modern language review* | 20 |
| 1. *world literature today* | 20 |
| 1. *american historical review* | 18 |
| 1. *kunstwerk* | 18 |
| 1. *cultural studies* | 17 |
| 1. *environment and planning d-society & space* | 17 |
| 1. *cuadernos hispanoamericanos* | 16 |

As is obvious from this list, in the last fifty years or so, imaginary is a concept closely associated with European literature and art, and with French thought in particular. However, influential and widely read English publications such as the *Times Literary Supplement* and the *New York Times Book Review*  have also been vehicles for its dissemination. Journals such as *Cultural Studies ,* *GeoForum* and *Environment and Planning D*(!) are the only representatives of non-literary or non-psycholanalytic disciplines in the list of journal publications which include the concept. Even if we break this table down over shorter time windows (I have not included these tables), the most recent time windows still display a literary humanities domination of work on imaginaries. Although social science journals such as *American Anthropologist*  or *Environment and Planning A* figure heavily, they are swamped by the work on literatures and arts.

Finally, how do people invoke or make imaginaries using the poetic-logical techniques of academic writing? To analyse this, I have taken approximately 4000 article abstracts from Web of Science, and using corpus linguistics approaches, counted some of the different ways imaginaries figure there. TBC …

[TBC: I've done some of this work, but it still needs to tidied up. I think it would be interesting, but maybe all of this is getting way too big for the planned article. It would

1. list the different qualifications or species of imaginaries by counting all the occurs of the form either 'imaginary/ies of x' or 'the x imaginary/ies'; and also count the relative weights of singular 'imaginary' vs plural 'imaginaries';
2. list the relations of possession and identity associated with imaginaries of the form 'imaginary/ies is/are/has/was/will' in order to see some of the attributions of essence, substance or property;
3. identify the main concepts or things associated with imaginary/imaginaries by counting overall keywords in the abstracts.

I see all this as a way of continuing the genealogy of making imaginar/ies, but moving into the literary-inscriptive practices of academic and academic-related texts.

## **Some key early nodes in the genealogy of imaginaries**

Before return to our STS material, there is a bit more genealogical foregrounding that is useful. In tracing STS sourcing and resourcing around the concept, the work of three key figures merits consideration: Kant, Sartre, and Lacan.

*Kant*

**[Although we haven’t done anything on Kant thus far, working through our materials made me think that we had to say something about:**

* **his work as a recurring reference point in the demarcating of science; the real vs the imaginary**
* **his philosophy as it is associated with common-sense notions of the imaginary as that which is not real.**

**This is very important because of some of the arguments (see esp. Verran 1998) about the denial of imaginaries within science]**

***Psychology,psychoanalysis and the imaginary: Sartre and Lacan***

In the first half of the twentieth century there are two key substantial intellectual treatments of ‘the imaginary’: the first by Lacan (see *Beyond the reality principle*, 1936) and the second by Sartre (see *The Imaginary: A phenomenological psychology of the imagination*, 1940). Both these texts tackle the concept by theorising the subject’s relation with images. In the former, the focus is on identification with the specular image (i.e., Lacan’s ‘mirror-phase’) and in the latter on distinguishing imagination from perception. While Sartre regards the exercise of imagination as entailing the conditions of possibility for ontological freedom, Lacan refers to identification with images as the conditions of possibility for subject-formation. For reasons that I will assume to be self-evident to the reader, Sartre’s existentialism never ascended in any serious way to inform contemporary continental social theory,

Lacan’s structuralist rereading of Freudian psychoanalysis has been a major influence on feminist theory, cultural studies, literary theory, and poststructuralist accounts of subjectivity, knowledge and desire (see Irigaray, 1977; Haraway, 1988; Gallop, 1985; Grosz, 1990; Butler, 1993). Thus, his Lacan’s conceptualisations of the ‘mirror phase’ and ‘the imaginary’ constitute important moments in the genealogical trail which concerns us here.,

Lacan’s account of the ‘mirror phase’ describes a permanent structure of subjectivity rather than a formative moment in the mental development of the infant. The mirror phase is essentially an account of ego development via objectification. Between the ages of 6 months and 18 months the child will look at and become fascinated with its own image; in that moment of identification the child recognises the image of itself as an integrated subject. But the child also recognises the *contrast* or *disjuncture* between this complete, external image and the feeling of having an uncoordinated body, which is perceived as fragmented. Thus the moment of identification is fundamentally ambivalent; the child derives pleasure at seeing itself as a whole self, but it also marks the child’s first recognition of its lack and absence, of its distinction between self and other. In other words, the visual *gestalt* is in conflict with what the child feels. The mirror image provides the ground for which the ego strives to become more complete than it feels, to become as complete as the image it sees. This marks the ego’s interminable dependence on images and representations; the other is internalised via images, but the subject also confuses the other for itself (narcissism). This conception of the ego as inherently *alienated* has important implications for feminism and theories of subjectivity. It challenges Cartesian views of the unitary subject, presenting instead an ambivalent and divided self, a subject constituted by processes of internalization, introjection, projection, and identification. In this endless game of identification there can be no general or transhistorical subject (Grosz, 1990).

The mirror phase is an important precondition for Lacan’s formulation of the imaginary. As part of his conceptual triptych – the Symbolic, the Imaginary and the Real – *the Imaginary order* is the relational and perceptual field of the ego. This is the first ‘event’, if you like, whereby the term ‘imaginary’ is transformed into the nominal properties of a domain. The spatial metaphors of ‘order’, ‘field’ and ‘place’ are invoked as describing a kind phenomenological or psychological (i.e., subjective) space of identification with images. There are two characteristics of the subject’s relation with images that are key to understanding the imaginary order. First, the relation between the subject and the image is one of radical *alienation*: ‘alienation is constitutive of the imaginary order’ (Seminar III: The Psychoses). Second, this relationship is *narcissistic*: the field of images and imagination is deceptive and illusory. Similar to the logic of the mirror phase, the image creates the illusion of synthesis, autonomy, duality and resemblance. What gives the imaginary its structure is the Symbolic order, the order of signs and signification. So even though the subject forms a (libidinal) relation to the image, it is the Symbolic that is constitutive of subjectivity. The imaginary is the effect of the Symbolic. Where the Symbolic and the Imaginary are linked insofar as the former constitutes the latter, the Real precedes and is fundamentally separate to the constitution of the ego. The Real is the order that precedes experience; it is not the same as reality but the *absolute contrast* to experience. It is ‘unassimilable’ in representation because it is ‘impossible’ to imagine and impossible to integrate into language, and can only be represented by inference or index. The Real has no boundaries, borders, divisions or oppositions: it is an undifferentiated ‘continuum of ‘raw materials’’ (Grosz, 1990: 34).

The Lacanian distinction between the Symbolic, the Imaginary and the Real is the first attempt to integrate theories of subject-formation with theories of language which seriously criticise Cartesianism and humanism. The relation between the ego and the Imaginary represents a productive tension or chiasmus between language and the body. This Lacanian ‘event’ is linked to several important transformations of the term ‘imaginary’:

* it signifies a new nominal group, i.e., a subjective domain of ego development;
* it links the ‘personal and political’ by showing that ego development is mediated by social and political processes, i.e. language and authority;
* it marks the entry of the term into a critical political discourse;
* it problematises the unitary nature of the subject.

I am not suggesting that my emphasis on subjectivity underscores every application of how ‘imaginaries’ is currently used in STS. However, I want to suggest that the term is sufficiently vague enough to lend itself to a number of different applications which emphasise some of the resources I have specified above. For example, the version of ‘imaginary’ or ‘imaginaries’ that appears in cultural studies or political philosophy stresses the mediated nature of knowledge. In the work Castoriadas, for example, there is a clear emphasis on psychoanalysis and otherness. In contemporary STS, I think there is a disavowal of psychoanalysis, but recent attempts to employ the term ‘imaginary’ represent new and subtle ways of inserting concerns about subjectivity and representation into the mediated nature of knowledge for and about science and technology.

**Imaginaries in the late C20 and early C21: STS clusters**

The foregoing sections of this article identify some background to the conception of imaginaries relevant to the STS work we have highlighted. As our own map of key deployments of this concept indicates (figure ), this STS research has taken rather different forms. Indeed, we have found it useful to identify the following distinct clusters of STS research on imaginaries, characterised with reference to their focus of investigation, canonical reference points, and research methodologies:

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

Inevitably, this categorisation is not hard and fast. We have tried to indicate this visually in the map provided as well as in the discussion below. The following sections analyse these key nodes in STS work with imaginaries. They also continue the genealogical tracking begun above, by indicating the lineage that informs these trajectories within STS.

## Anthropological/ethnographic approaches to imaginaries

### Marcus, George E. *Technoscientific imaginaries: conversations, profiles, and memoirs*. University of Chicago Press, 1995.

The title of the 560 page volume *Technoscientific imaginaries: conversations, profiles, and memoirs*  suggests that it could be a major landmark in mid-1990s work on science, technology and imaginaries. How did such two dozen cultural anthropologists come together around this theme? Strikingly, the term imaginaries is not indexed as such, although there are three index references to 'technoscientific imaginaries' and several to 'scientific imaginaries.' This is not just a problem with the index. An electronic search of the volume on books.google.com yields only a few more. How would there be such little reference to imaginaries in this book? For such a large book, the absence of reference to imaginaries is puzzling.

Probably it has something to do with the way the book came together as an 'opportunistic assemblage' (1) in the Late Editions series of annuals. The pieces of the book all concern conditions of work in science and technology at the end of the century. 'The term *imaginary* emerged effortlessly and just seemed to fit the topic' (3) writes George E. Marcus. Imaginary was envisaged as linking scientific visual and imaging practices with the imagining of technoscientific futures.

We instead were much more interested in the imaginaries of scientists tied more closely to their current positionings, practices, ambiguous locations in which the varied kinds of science they do are possible at all. 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 4)

quite the senses of Yet the sense of imaginary developed in the volume did not *Hence the sense of imaginary developed in the volume was not oriented by the idea of imaginary as referring to high-flown visionary thoughts:*

*We instead were much more interested in the imaginaries of scientists tied more closely to their current positionings, practices, ambiguous locations in which the varied kinds of science they do are possible at all. 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 4)*

*The notion of imaginary developed in the Introduction to the volume, but also in later chapters, connects scientific practices (including imaging and visualising) with the ambiguous cultural and social locations scientists find themselves in. Indeed, this is the very core of technoscientific imaginaries in this book: they are see as responses to or symptoms of an instability or uncertainty that occurs when available discourses fail or block experience. Imaginaries become more salient, problematic or contested under such conditions.*

*The 'socially and culturally embedded sense of the imaginary' quoted above is thus a slightly misleading formulation. While it could be read as connoting that aspect of science of technology deriving from social or cultural context, actually the sense of technoscientific imaginary developed in the book is quite different. It refers to the ways in scientists themselves to lesser or greater degrees express awareness of changes in the location and position of their own practices. Rather than being a concept used by the social studies of science to situate technoscience in social locations, a technoscientific imaginary describes how scientists and technologists working in specific settings embody the tensions and predicaments of change. If future visioning has a role here, 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' (4). Like many other invocations of the imaginary, a technoscientific imaginary inhabits a 'cognitive gap' (4). It derives from tensions between practices and discourses that do not quite fit. Importantly too, the notion of a technoscientific imaginary bears political and methodological implications. It generates 'a completely transformed and vast field of inquiry on which a distinctly cultural studies of science might establish itself' (7).*

Why then so few references to imaginaries in this book? We could answer methodologically: the notion of imaginary outlined above suggests that it would be useful to ask scientists about their relation to their own activity, about changes in what they are doing, about the possibilities of doing science and about their hybrid locations and collaborations. In the process of doing that, the book presents conversations, memoirs and interviews that document technoscientific imaginaries, but in themselves, have little reason to invoke imaginaries as such.

### Taussig, Karen-Sue (1997) ‘Calvinism and Chromosomes: Religion, the Geographical Imaginary and Medical Genetics in Netherlands’, *Science as Culture* 6 (4); 495-524

Karen-Sue Taussig (1997) advances the notion of the ‘geographical imaginary’ to capture 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). Drawing in part on work of Edward Said on Orientalism, Taussig highlights that through this imaginary, behaviours and identities are often ascribed to others in ways that serve the interest of the majority. In the case of the Netherlands, Taussig argues that in the “ popular imagination”, Dutch people position the minority Orthodox Calvinist population in opposition to their own sense of themselves as modern and secular. Her case study follows a young Dutch couple who wish to undergo PGD (preimplantation genetic diagnosis) to avoid having a child with CF and whose interactions with clinical geneticists is coloured by their being from Zeedrecht, a village in the region of the Netherlands known for its strict Calvinism and understood to practise consanguinity. Taussig documents the way that understandings of geographical, social and religious difference, deemed to have medical consequences in the case of genetic disorders such as CF inform medical decision-making and are implicated in the production of clinical knowledge about certain bodies.

In summary, Taussig uses the notion of the imaginary to draw attention to the way that social and cultural conceptions of others is often rendered in terms of geographical locality and is conveyed through various images, representations, and narratives that have widespread currency. In doing so, Taussig emphasises that the way people imagine the world and imagine others to be does not necessarily reflect who they really are and what they really do but clearly can have real consequences for them.

### Verran, H. 1998 ‘Re-imagining land ownership in Australia’ *Postcolonial Studies* 1 (2) 237-254

To be able to get on with their negotiations, the Cape York pastoralists need to recognise that collective picturing and storytelling about the land with its possibilities for emotional ladenness and material embeddedness is an inherent way of knowing it and owning it; and that Western picturing is no more and no less rational than Aboriginal ways of picturing and thus knowing and owning the land. Picturing and stories embedding metaphors are as much a shared ontic/epistemic resource as the rules and regularities which accompany them. That is, as long as moderns *recognise* their picturing and storytelling, we moderns can become as rational as Aborigines. 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 can work with other communities – human and non-human (Verran 1998: 249).

I have reproduced the lengthy quote above because of its detailed specification of imaginaries and their role in knowledge-making. Imaginaries involve picturing and storytelling; they may be emotionally laden and are materially embedded; they are a shared ontic / epistemic resource; and they are denied or go unrecognised by Western knowers. The key problem or issue that Verran addresses with the concept of the imaginary is the capacity to negotiate between / across knowing and knowledge-making practices. This is a somewhat abstract formulation of her project, however, because this problem is bound up with: human exceptionalism; the way that the nature / culture binary and boundary has been constituted; and the privileging of white Western ways of knowing and related systems of law and justice which encompass both philosophical theorising and particular empiricisms. Verran addresses the very material consequences of such practices in terms of land use and land ownership in Australia, where the post-colonial context renders the issues extremely starkly. She suggests that: ‘looking at some of their puzzles [those faced by participants in negotiations over native title and pastoral leases] allows us to see an element inherent in knowing which, currently, is 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’ (238).

Verran positions her paper as a contribution to both postcolonial studies and science studies. The contribution that she hopes to offer to science studies is a conceptual resource for moving beyond what she calls ‘the now quite common descriptions of heterogeneity’ of knowledge systems (239). For postcolonial studies she is offering resources for negotiating contested knowledge and property claims. She uses the concept ‘the imaginary’ in the singular when she refers to it as an overlooked element inherent in knowing, but in the plural when she argues ‘that we cannot begin to understand this politics [struggle over different knowledge-making practices] without paying attention to ontic/epistemic imaginaries’ (239). Verran suggests ‘the ontic/epistemic imaginary’ as a preferred identifier for the conceptual resources usually referred to as ‘the dreaming’ in English (242) – the sense that Aboriginal Australian peoples have of their access to a ‘vast repertoire by which the world can be re-imagined, and in being re-imagined be re-made’ (ibid). The pastoralist descendants of European ‘settlers’ cannot access such a repertoire to ground their claims to land ownership, points out Verran, but must rely on the rigid facts of quantifying and surveying the land, even if individually they draw on metaphors to represent the land, as ‘the domain of art and emotion’ has no place in their negotiations over property. Verran’s points are well made, but I think her suggestion that ‘individuals’ might draw on such metaphors undercuts their collective constitution, but this may be because she is still unfolding her argument at this point in the paper.

Verran discusses the importance of story-telling and the working-up of metaphors in the knowledge-making and negotiating practices of Aboriginal peoples in Australia. She stresses the importance of ‘owning and publicly articulating the stories through which the land is meaningful as a set of interconnected places’ as providing the stock from which the multiple complex metaphors used in negotiating in Aboriginal Australia stem (241). Further, she suggests that the working-up of metaphors provides possibilities for imagining new categories and reworking old ones in new ways (241-2). Struggles for cognitive authority within and between clans are waged through pitting metaphor against metaphor to see which one will carry the day and Verran suggests that the one which prevails will have been greatly enriched in this process. She argues, however, that when in contest with Western knowledge-making practices, Aboriginal knowledge systems are often understood as at best partial. Of course, as Verran herself points out, other knowledge-making practices are coming to be or are already understood as similarly partial in science studies, but this understanding does not necessarily travel into the spheres where laws are made and tested.

Verran points to another problem – this time with regard to agency which she unpacks in relation to a 1970 legal ruling. In that case, although the judge acknowledged that the Aboriginal claimants challenging the development of a bauxite mine on land they understood their clans to own, had established the existence of a subtle and powerful knowledge system, linking clans to each other and to particular sites, it did not provide for any proprietary interest in the land. Rather it seemed to provide for an understanding that ‘the clan belongs to the land’. Verran’s choice of quote from the ruling graphically illustrates that even though the judge was not prepared to say that the land belonged to the clan, in his reversal he did not suggest that the land owned the clan because of the investments in human agency and control of ‘nature’ intrinsic to his own knowledge system. Verran argues that Western philosophy is: ‘Blinded by an epistemology obsessed with scientific knowledge, [and that] theory is taken to be the sole expression of true knowledge’ (238). However she asserts that an interest in ‘other’ knowledge traditions has ‘recently emerged rather differently both in empirical and in speculative work in science studies, associated with a concern for the actual practices of doing science’ (ibid).

Verran draws on her analysis to make some immodest suggestions to the pastoralists for the appropriate way to negotiate over land ownership. She writes that she would point out that they need to understand that they are involved in a process of knowledge making and that they can learn from Aboriginal Australians that such a process is a highly local affair, negotiated over ‘particular issues at particular places by particular people’ . She calls this an embedded or performative understanding of knowledge making. The second insight she would offer to the pastoralists is that they need to understand that ‘both an imaginary and a logic, intimately meshed, are involved here’ (243). She acknowledges that taking these understandings on would be difficult, however, as they would understand such negotiation not as knowledge-making, but as dirty politics. ‘Moreover’, she writes ‘they have always lived in a world where true knowledge has no imaginary. Modernity circumscribes its imaginary as of aesthetic, but not ontic or epistemic interest’ (243). Here Verran returns to the issue of agency as she claims that for Westerners only one side can have agency in knowledge-making. However she proposes to attempt to disrupt this understanding by focusing on the absent imaginary in Western epistemological traditions.

She argues 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’ and ‘suggest(s) that moderns need to bring back into view our denied imaginaries so we can more easily get on with the business of working knowledge traditions together and recognising non-human agents, as we make knowledge and remake worlds’ (243). Whilst I am in complete agreement about the need to bring denied imaginaries back into view, I think Verran’s predication of such a move on ‘see(ing) through the universalist pretensions of the sciences, and recognising the violence that lies behind these pretensions’ (ibid) is problematic. As she notes herself, the denial of imaginaries is dependent on privilege and much rhetorical and political economic work goes into shoring up that privilege. The effort to bring denied imaginaries back into view will be heavily contested, cf the so-called Science Wars and the mundane and tedious boundary work that goes on between science and science fiction in various public spheres. That said, however, I do think that Verran’s suggestion that thinking ‘the imaginary’ or ‘imaginaries’ as constituted by and constitutive of ontic/epistemic commitments is very helpful in this project.

Verran works this through in relation to Western ontic / epistemic commitments by reading Kant through Michele Le Dœuff, pointing out that Kant sees the exclusion of the imaginary as the defining property of reason, but that he can only represent this exclusion through the use of imagery and extended metaphor (picturing and storytelling). Le Dœuff accounts for this paradox as embodying Kant’s attempt both to justify the inclusion of philosophy in modernity and to give a vivid picture of what modernity would look like. Verran suggests that what is to be done now is to take Kant’s metaphor of the island – the territory of pure understanding – seriously and in full. That is ‘to see the island and the seas which surround it as integral to each other. 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 drawing out a comparison of the ontic and epistemic commitments of Western and Australian aboriginal knowers Verran suggests that analogous boundary making and meaning making practices are undertaken – both knowledge systems combine imaginaries and logics. However, the key difference that she points to is the open acknowledgement of the making and traversing of boundaries in Aboriginal communities: ‘The paradox inherent in meaningfulness, in making ontic/epistemic commitments, is acknowledged and celebrated’ (248). This isn’t a utopian account of meaning-making, however. It is strongly normative: ‘there is a correct “map” which everyone knows in greater or lesser detail, and the “map” may be expressed in more or less elegant ways’ (248).

Verran concludes her paper by emphasising explicitly that imaginaries are not located in minds, but in practices: It is in the everyday messing around with mucky, obdurate stuff, and in the conversations and other texts – official and unofficial – that imaginaries are enacted and enact. The imaginaries imminent (*sic*) in practices interpellate those objects / subjects that / who are implicated in and by the practices, helping to constitute them as objects / subjects (252).

Verran is arguing that the work that imaginaries can do is only possible if they are explicitly recognised and shared – at least partially – by a community. But she is not only arguing that it is their existence that should be recognised, it is also their working together with what she calls a logic in a performative mode of knowledge production. Imaginaries should be included in, not excluded from knowledge-making if ‘an unacknowledged politics of coercion and insidious translation’ is to be disrupted (252).

### Lee and LiPuma

If we think that imaginaries matter, then we might be interested in how they are made, and how they could be made differently. The two articles under discussion here – 'Cultures of Circulation: The Imaginations of Modernity' (Lee & LiPuma 2002) and 'Imagined collectivities and multiple authorship' (Strathern 2006) – lay down some interesting challenges. Both articles are written by anthropologists focusing on contemporary media and public cultures, albeit from very different angles. Lee and LiPuma present imaginaries as forms of collective agency paradigmatically embodied in publics, in citizen-states or in markets (Lee & LiPuma 2002, p.194) They draw on the work of Marx, Anderson and Appadurai, as well as a range of cultural anthropology (Malinowski, Mauss, etc.) in order to analyse contemporary capitalism and financial markets in particular. They suggest that the processes of exchange and circulation found there constitute a new kind of imaginary that we are just beginning to inhabit. Marilyn Strathern's article also has a contemporary focus: shifts in the notions of creativity and property associated with open source software, but her emphasis is very different. She argues that collectives themselves can only be imagined: the very title of her article 'imagined collectivities' suggest that the mode of existence of collectives is imagined. Both articles converge in several basic concerns (for instance, the idea that the very existence of collectives depend on imaginaries), but differ on how they analyse this dependence.

For Lee and LiPuma, the three principal imaginary components of Western modernity (as per Charles Taylor) of market, state and publics all derive from processes of circulation. For them, the key problem is to understand how imaginaries arise from circulation. The 'cultures of circulation' they refer to generate imaginaries not only through movement in general, but through 'cultural forms' that constitute collective agency. The cultural forms they focus on in their discussion are made performatively, through forms of self-reflexivity, through circulation, and through processes of exchange (207). The reliance on performativity in an article published in 2002 is hardly surprising. That concept was heavily discussed from the late 1990s onwards. Its role in this context is to provide a way of explaining how circulation can do something or make something. The performatives Lee and LiPuma invoke all play out between first person and third person positions. For instance, in relation to the citizen-state imaginary, performatives connect 'we' and 'the'; for instance 'we citizens' somehow become 'the people.' In order to make this connection possible, something indexical must also instantiate the totality it points to. Much of this sounds quite abstract as a mechanism. It is indeed abstract partly, I think, because Lee and LiPuma are interested above all in theorising contemporary capitalism. Their account of the performative constitution of social imaginaries has as its *telos* 'the historical transition we are undergoing' and the 'transformed set of social imaginaries' associated with it (211).

The usefulness of Lee and LiPuma's account is threefold. First, the extension of performatives to cultures of circulation is a theoretically sophisticated non-foundationalist account of how imaginaries take shape. Secondly, their approach is also able to explain how some imaginaries bear within them strong tendencies to become autonomous. The collective agency or imaginaries of Western modernity such as 'the market', 'the public' or 'the State' are 'fetishized figurations' of an 'objectified conception of totality' (193-4). In comparison to gift-based forms of sociality, they take on a quasi-autonomous existence, seemingly independent of specific culture or individual actions. Thirdly, Lee and LiPuma's interest in circulation-based capitalism, exemplified in the lengthy discussion of financial derivatives markets, seems to me to lay down a set of challenges for any contemporary concept of imaginaries based on semiotic analysis of cultural forms. Problematically, their insistence on global totality and capitalism seems to reproduce the very 'objectifications' they are trying to understand. At the same time, their emphasis on circulation as an analytical problem, as something that has value in its own right, seems crucial to me in any understanding of the making of imaginaries.

#### Kim Fortun & Mike Fortun (2005) ‘Scientific Imaginaries and Ethical Plateaus in Contemporary US Toxicology’, *American Anthropologist* 107 (1); 43-54

Kim Fortun & Mike Fortun (2005) address the current direction of toxicology, imagined by some of its practitioners as a ‘civic science’ and the role that the anthropology of science can play in shaping the future trajectory of this field. They argue that through a study of imaginaries as they are articulated by scientists, ethnographers can then – in the spirit of ‘friendship’ – help scientists negotiate change in their field and provide the means for engaging with its social, ethical and legal implications. They are supportive of this idea that toxicology can be a ‘civic science’ that serves to protect the public’s health and not simply the interests of industry or the state and that anthropologists have a role to play in ensuring that this is the case.

For Fortun & Fortun the notion of toxicology being 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 George Marcus (1995) and his discussion of ‘technoscientific imaginaries’, they suggest that the study of ‘imaginaries’ provides a way of looking at large-scale changes over time and how these are understood locally. Moreover, they contend that through the focus on imaginaries, analysts can study the forces that are constitutive of subjectivity and, indeed, they state that their interest lies in understanding subject formation, extending the work of Sharon Traweek in the 1980s. Their paper therefore draws on interviews with some leading toxicologists who imagine the ways that their scientific field can become a civic science, drawing on historical experience such as environmental disasters such as the Bhopal incident in India in the 1980s and epistemic and technical changes related to the adoption of genomics and informatics. Fortun & Fortun read these imaginaries as being at work in the articulations and actions of these statements.

However, as I have said, their use of the imaginary is also bound up with their own concern with opening up new spaces of possibilities for refashioning toxicology, redefining its mission, and deciding who is involved in setting this mission. They see that there is a role for anthropologists and other scholars from the humanities and the social sciences to play in this regard and they call for an “ethnography of ethics and friendship with the sciences”. From this perspective, they claim that the ability of ethnographers to draw out ‘scientific imaginaries’ contributes not only to anthropological theory and methods but also to ability of this field to shape the future direction of sciences such as toxicology. By focusing on the level of scientific practice, Fortun & Fortun contend suggest that by being a ‘friend’ – as opposed to being a judge which is the dominant mode of science studies today – ethnographers can access the imaginaries of the sciences and allow them to help scientists negotiate change in their scientific fields and provide ways for articulating their social and ethical implications.

### Strathern (2006)

By contrast, Strathern's article is less about any particular imaginary, and more about underlying assumptions concerning the very nature of collectives. These assumptions all revolve around property and ownership, and the usually unquestioned opposition between sharing and individual ownership on which comparisons between Western modernity and other cultures often rely. For Strathern, property is key to collective imaginaries, but a simple contrast between shared and individual property does not all suffice to describe how property matters. Via a contrast between the human genome – an epitome of something that is subject to claims of shared and individual ownership – and the making of a New Ireland *Malanggan*, (a 'sculpture commissioned by a dead man's relatives' (14)), she suggests that we might be able to pay closer attention to the notions of property implicit to our collectives (16). Although the details of how *Malanggan* are made and circulated are crucial to Strathern's argument, it would be difficult to reproduce them here. Rather, and at the risk of distorting her analysis, I will extract from her description some results concerning a better form of collective, a 'community defined by knowledge of its sources' (23). This, after all, is the point of the analysis of the *Malanggan* as images or designs that circulate. First, such a community would be less in enthralled by 'disposable possession' of things, than with 'a right to protect an enablement' (17), and this enablement concerns the power to reproduce a form or design at some other time in collaboration with other people. Second, in a community defined by knowledge of its sources, 'deriving a performance from an earlier one is what gives its new appearance validity' (21). Derivation rather than novelty imbues things with value, and derivation inevitably brings in 'multiple authorship' rather than individual invention. Third, in a community defined by knowledge of its sources, not everything is made public: 'the creation is never fully revealed; one always imagines that there must be some other, hidden side' (22).The listener or witness supplies something vital, the confirmation or validation of value, and this does not concern solely what has been brought into the public eye but also what might happen in the future or has happened in the past.

Standing back a little from these two accounts, what do they offer in terms of making sense of imaginaries? In both, circulation and dissemination are creative processes in their own right, and they both call for attention to the forms of circulation – the self-reflexive, indexical icon of Lee and LiPuma; the flows of transfers, rights, performance, and validation in Strathern's *Malanggan.* Both address contemporary transformations in imaginaries, albeit with quite disparate framings. Lee and LiPuma's almost world-system level gaze seems vast and all-encompassing in comparison to Strathern's dissection of some issues concerning notions of property associated with software. Finally, both provide some ways of situating imaginaries as processes occurring with specific practices and materials, rather than as a nebulous and pervasive essence. In thinking about imaginaries, I see them as useful in different ways. The strength of Lee and LiPuma's account comes from its theorisation of how imaginaries emerge. The strength of Strathern's derives from her self-reflexive stance in relation to any invocation of imaginaries, and in her account of what a contemporary imaginary might do to address the issue of its own making.

## **Socio-political/institutional approaches to imaginaries**

### **Benedict Anderson’s *Imagined Communities***

Benedict Anderson’s *Imagined Communities: A reflection on the origin and spread of nationalism* (1983) has become a canonical text for those interested in nation formation, national identities, and/or nationalism. His key insight was the insistence that nations are *imaginary* communities and thus, that it was necessary to identify the historical developments that made affiliation and identification possible without direct interaction amongst individuals. As such, this text identifies the mechanisms that conjure and sustain the nation state. Anderson 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).

Although Anderson’s book is focused on the imaginaries underpinning nations and nationalism, some aspects of his arguments are important in considering imaginaries linked to science. Anderson demonstrates the importance of communication processes – modes of address (in his study—the addressing of the public *as* a public) and of the mass media in generating collective imaginaries. Anderson’s thesis emphasised that the emergence of print media facilitated new forms of communication and identification that instantiated the nation. In analysing *scientific* imaginaries, it seems important to explore both the communication processes and the media that enable/instantiate these imaginaries.

However, Anderson’s investigation of nationalism may be linked to scientific imaginaries in another way. Despite the claims about the universality of science, scientific imaginaries are often cast with reference to nation—national promise, benefits, and good.

Some issues/questions arising from Anderson’s work could 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 re nation different from those at play around scientific imaginaries
* how and when are national imaginaries and scientific imaginaries brought together

### **Charles Taylor’s *Modern Social Imaginaries***

The Canadian philosopher Charles Taylor’s book *Modern Social Imaginaries* (2004, 2007) appears in the interesting Public Planet Book Series published by Duke University Press. In this book Taylor traces the features and history of Western modernity. He frames his own project as drawing heavily on Benedict Anderson’s *Imagined Communities*, as well as the work of Jurgen Habermas, Michael Warner and Pierre Rosanvallon (Taylor 2007: 2). He contends that: ‘Western modernity ...is inseparable from a certain kind of social imaginary’ (Taylor 2007: 1). Taylor presents the social imaginary as ‘the ways we are able to think or imagine the whole of society’ (Taylor 2007: 62) and he explains that, as such, it ‘is not a set of ideas; rather, it is what enables, through making sense of, the practices of society’ (Taylor 2007: 2).

Taylor suggests that the centre of the modern Western social imaginary is the idea of a moral order. He detects the origins of this idea in the theories of Grotius and Locke. While he considers that this idea has these specific theoretical roots, it is its transformative absorption into the social imaginary which most concerns him. The economy, the public sphere, and the practices and outlooks of democratic self-rule (Taylor 2007: 69) are the realms in which Taylor identifies these transformations and much of the book is taken up with his account of how these domains emerge as distinctive from the political sphere. He also presents his own interpretations of both the French and American revolutions as key episodes in the forging of the modern Western social imaginary.

Taylor’s project underscores the features of Western modernity, whilst leaving open the possibility of there being *other* modernities. He is obviously reacting to those who see Western ‘civilisation’ (which is a term he uses as virtually synonymous with moral order) as spreading or being imposed globally. Indeed, he sees his historical review as providing an argument for plurality, challenging the practice of ‘seeing modernity as a single process of which Europe is the paradigm’ (Taylor 2007: 196). As such, there seems to be a tension at the heart of Taylor’s project. The emphasis on specificity seems designed to allow for diversity, for other versions of modernity. Yet, Taylor never seems to question the assumption that there *would be* other modernities or that the notion itself might be Eurocentric.

Many other problems could be identified in Taylor’s project. It seems 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 gradually pervading the rest of society. Europe is assumed to be an unproblematically cohesive unit and unity. 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. 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.

Despite my reservations about Taylor’s framework, there may be strands of his work which could be relevant to our consideration of the imaginaries of technoscience. However, we would have to begin by noting that his primary concern is with a rather broader concept -- the *social* imaginary. This aside, it may be useful to examine his understanding and mobilisation of this concept. The term designates a collective mechanism which informs and animates social life.

His take on idealism is also striking. He anticipates and handles the charge that the concept of social imaginary ‘smacks’ of idealism assertively and his rebuttal may merit our attention. He contends:

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)

Within his analysis of the American Revolution, he refers to the social imaginary as ‘what makes sense of our practices’ and he suggest that we might think of it as a ‘kind of repertory... including the ensemble of practices they can make sense of’ (Taylor 2007: 115)

### Joan Fujimura (2003) ‘Future Imaginaries: Genome Scientists as Sociocultural Entrepreneurs’, in Goodman, Heath & Lindee (eds) *Genetic Nature/Culture: Anthropology and Science Beyond the Two-Culture Divide*, University of California Press.

Fujimura argues that imagination is a social practice in science and technology and that the crafting of future imaginaries is part of the work of scientists. To illustrate this, she takes the cases of two leading Japanese scientists in the fields of genomics and computer science who have crafted two different imaginaries that link investment in innovative science and technology with discourses of cultural and religious distinctiveness. In this way, as Fujimura points out, these imaginaries are ‘technosocial imaginaries’ since they conjure up both alternative futures for scientific research and practice and a redesign of society and culture that negotiates notions of Japanese uniqueness in a context of a transnational economy in biology, genomics and computing.

Following Appadurai, Fujimura distinguishes the future imaginaries of these scientists from ‘mere fantasy’ because around these visions communities and practices have been formed. As Fujimura concludes: ‘the work of the two scientists I discuss here has led to enterprises that have enrolled and engaged many people, funds, and government agencies, and much public and consumer interest’ (Fujimura 2003: 192). The claims that she makes about these future imaginaries is therefore rather similar to those made by scholars writing about the sociology of expectations. Indeed, she understands imaginaries in terms of being enabling visions that marshal resources and communities around them and which might be distinguished by persuasive rhetoric and hyperbole. There are connexions to be made here between her notion of ‘technosocial imaginaries’ with its emphasis on national and cultural identity and Jasanoff and Kim’s (2009) more recent articulation of the ‘sociotechnical imaginary’. Fujimura concludes by a call for a ‘sociology of the future’ that will permit social scientists to intervene in the envisioning of futures before they are materialized by other and more powerful actors. In my reading of this chapter Fujimura understands the visions articulated by these two scientists as producing imaginaries about the future that connects calls for investment in specific science and technology with powerful notions of nationhood and cultural distinctiveness in order to gain traction and legitimacy. In this way, these scientists, by invoking Japanese religious traditions of Buddhism and Shinto, are also making cultural claims in order to enlist others in their respective visions. On this point, then, perhaps I can see why the notion of imaginary is more appropriate than the notion of ‘expectation’ as it has been elaborated by scholars to date.

### .Jasanoff, S. & Kim, S. (2009) Containing the Atom: Sociotechnical Imaginaries

### and Nuclear Power in the United States and South Korea. *Minerva* (2009) 47:119–146.

In this article Jasanoff and Kim introduce their concept of the ‘sociotechnical imaginary’ in relation to a comparative study of the regulation and reception of civil nuclear power in the USA and South Korea. Importantly for our discussion, the article also has a section devoted to discussing the concept of the imaginary both in relation to past uses of the term in social theory generally and in relation to the field science studies in particular. They also compare and contrast the concept of the imaginary with similar modes of social scientific explanation to further clarify what it is that this particular concept can reveal.

Jasanoff and Kim begin their discussion by noting that the relationship between science and technology with political institutions is under-theorised when compared to the rest of the field of science and technology studies. Most other studies, they argue tend to focus on the production of scientific knowledge in laboratories and expert communities, and so on. These observations point us towards the field of study where they feel their concept of the sociotechnical imaginary is most useful. This is the political field around the state and its role in defining the public good, the purposes, pace and direction of public scientific investment and the parties and fora suitable for the governance or closure of science and its controversies. Flowing from this is a key question: ‘How do national S&T projects encode and reinforce particular conceptions of what a nation stands for?’(120).

Here we have the central research concern for our authors, which is to explore how national political orders and technoscientific projects co-produce each other. They have developed the concept of a national sociotechnical imaginary to examine this field, providing a definition highlighted in scare quotes, telling us that these are ‘‘collectively imagined forms of social life and social order reﬂected in the design and fulﬁllment of nation-speciﬁc scientiﬁc and/or technological projects’’(120). Such imaginaries, they add ‘at once describe attainable futures and prescribe futures that states believe ought to be attained’ (120).

Jasanoff and Kim’s work is focused on the national sphere and on cross-national comparisons to uncover the roots of national variation, so that ‘sociotechnical imaginaries can be identiﬁed, illuminated, and critiqued through cross-national comparison’ (121). The science and technology policies of nation states thus provide ‘unique sites for exploring the role of political culture and practices in stabilizing particular imaginaries’ (121). Despite globalization, sociotechnical imaginaries remain intertwined with nation building and the national sphere. While there may be multiple and contending sociotechnical imaginaries at play in any society, some are selected to become dominant and are made durable through a process involving the power of nation states to control the instruments of meaning-making and goal-selection for the nation (123), allowing us to speak of specific national sociotechnical imaginaries. At the same time Jasanoff and Kim urge us not to see the national as something simply given or immutable, instead describing the co-production of technoscientific and political order, where national entities are ‘reimagined, or re-performed, in the projection, production, implementation, and uptake of sociotechnical imaginaries’ (123). A historical analysis is also needed to show how these imaginaries are sustained and ‘invoked and re-performed at key turning points in policy formation’ (122).

For Jasanoff and Kim, the main locations where these imaginaries are to be found and studied appear to be textual ones, in policy documents, speeches and public discourses. ‘Language is a crucially important medium for the construction of imaginaries’, they claim, and therefore to make their particular case studies of sociotechnical imaginaries they identify and compare ‘recurrent discursive elements in each country’s official policy narratives for nuclear power’ (122). However in an important footnote they add that ‘mass media, popular culture, and visual materials also play critically important roles in the articulation of sociotechnical imaginaries’ and that these other media and forms could also be worthy of study (n.2, 122).

Before presenting the bulk of their argument in terms of detailed empirical analysis of the twists and turns of the USA’s and South Korea’s nuclear policy, the authors give us a relatively brief but important section further elaborating the concept of sociotechnical imaginaries in relation to existing social theory on the imaginary and to similar concepts, noting a growing recognition in social theory that ‘the capacity to imagine futures is a crucial constitutive element in social and political life’. They outline and build upon a canon of work theorizing the imaginary (Castoriadis, 1987; Anderson 1991; Said, 1978; Foucault 1979; Bowker and Star 2000; Scott 1998; Appadurai 1996; Taylor 2004). In laying out this canon they append a sentence extracting key point or ‘take home message’ on the nature of imaginaries to each key thinker that they list (122).

They start with Sarewitz (1996) to make the point that “imagination is no longer seen as mere fantasy or illusion” but instead as a cultural resource that brings into being new forms of life. [N.B. *Not having read Sarewitz, not sure if he makes this point positively, or negatively, and is used as an example of this error*]. Castoriadis (1987) is referenced to make the point that the imagination does not reside as an aesthetic quality in individual minds, but rather helps produce collective interpretations of social reality through shared systems of meanings. Next in their list comes Anderson (1991) who is invoked to make the point that these shared meanings form the foundation for a shared sense of belonging to an imagined community. Said (1978) is deployed to add that as well as solidifying a sense of who is inside a shared community, they also construct who is outside and construed as “the Other”. Foucault (1979) Scott (1998) and Bowker and Star (2000) join the list for bringing the insight that imaginaries guide the standardization of human subjects to render them governable. Finally Appadurai (1996) and Taylor (2004) are brought in to sum up the place of imagination in social theory, as ‘’an organized ﬁeld of social practices,’’ forming a ‘key ingredient in making social order’ (122).

Next, our authors go on to discuss another body of work more specifically in the field of STS (Fujimura 2003; MacKenzie 1996; Borup et al. 2006; Hedgecoe and Martin 2003; Marcus 1995; Wynne 2005; Fortun and Fortun 2005). They begin this by making a distinction between STS and histories of science and technology. The latter field, they claim, merely sees imagination as residing in individual minds, whereas the opposite understanding is crucial and defining for STS, where ‘promises, visions and expectations of future possibilities are embedded in the social organization and practices of science and technology’ associating the work of Fujimura (2003) and MacKenzie (1996) with this point. Furthermore, these collective and embedded forms of imagination shape the trajectories of science and technology (Borup et al. 2006; Hedgecoe and Martin 2003).

In their discussion of Marcus’s (1995) collection, Jassanoff and Kim imply a distinction between his term ‘technoscientific imaginaries’ and their own ‘sociotechnical imaginaries’. Technoscientific imaginaries, they argue, do not perform futures solely through technoscientific practices. Rather, drawing on Wynne (2005) and Fortun and Fortun (2005), they argue that these imaginaries of technoscience also carry implicit assumptions of the public good for ‘the social world writ large’ (123), and that therefore ‘technoscientiﬁc imaginaries are simultaneously also ‘‘social imaginaries,’’ encoding collective visions of the good society’ (123).

To further clarify their use of the term imaginary they then make a series of contrasts with other concepts that have been similarly used in exploring the cultural, social or political dimensions of technoscience, such as, ‘policy agendas’, ‘master narratives’, or ‘media packages’ around ‘discursive frames’. Thus imaginaries are less explicit, issue specific and instrumental than policy agendas. Rather they ‘reside in the reservoir of norms and discourses, metaphors and cultural meanings out of which actors build their policy preferences’ (123). At the same time, however, imaginaries are more instrumental than master narratives and are also not the simple justificatory lessons of past events of these narratives but instead are future oriented and ‘project visions of what is good, desirable, and worth attaining for a political community’ by articulating feasible futures (123). While they project hopes and promises, imaginaries also project fears and risks around innovation. In contrast to the 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 society, some become filtered and selected into the more dominant and goals of state and public action.

Jasanoff and Kim sum up this discussion of how the imaginary differs from these similar concepts by telling us that: “imaginaries 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).

The rest of the article – its main bulk - then goes onto give us a detailed description of civil nuclear energy policy battles in the USA and South Korea. Here the term ‘imaginaries’, which gets used in the general discussion, tends to be replaced by the singular ‘imaginary’. The cross-national comparison between the USA and South Korea allows Jasanoff and Kim to discern two different national sociotechnical imaginaries at play: ‘Although nuclear power and nationhood have been imagined together in both countries since the beginning of the atomic age, the nature of those imaginations has remained strikingly unlike’ (121). They find that the dominant national sociotechnical imaginary of nuclear energy found in the USA was an ‘imaginary of containment’, summed up by the slogan ‘Atoms for Peace’. In South Korea, however, the dominant national sociotechnical imaginary was of ‘atoms for development’ or an ‘imaginary of development’ which mainly saw nuclear power as a path to self-reliance and national independence.

The USA’s imaginary of containment emerged as policy makers sought to emphasise that nuclear technology could have a peaceful and benevolent use, that civil nuclear technology would not lead to the proliferation of military uses (126), that the hazards of radiation and nuclear waste could be contained (129), and also that public fear and dissent could also be contained (128). This imaginary was shared by both state and civil society (125). Therefore, as well as serving the nuclear establishment, this dominant imaginary could also lend traction to social movements opposing nuclear power, leading to significant setbacks for the technology in the USA. In contrast, the dominant South Korean nuclear national ‘imaginary of development’ (also shared by state and society) meant that fear of loss of national autonomy and self-reliance overrode fears of nuclear risks, leading to a more successful reception of the technology in that country.

Thus Jasanoff and Kim allocate a powerful role to sociotechnical imaginaries as key factors in questions such as whether the nuclear energy ambitions of powerful states are embraced or rejected by society, alerting us to not only the ‘not only the material and organizational resources that states deploy but also the imaginative resources with which they relate such policies to the public good’ (141).

### Smith, Elta (2009) 'Imaginaries of Development: The Rockefeller Foundation and Rice Research', Science as Culture, 18: 4, 461 — 482

Smith analyses the changing representations over the past 50 years of rice research by the Rockefeller Foundation (RF). This involves a study of different framings of problems and potential solutions by the Foundation, and how these incorporate wider ideologies, epistemologies and networks. The initial question she poses is how do these powerful philanthropic institutions 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 a ‘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). In this work she uncovers two key Rockefeller ‘representational strategies’ of ‘paternalism’ and ‘homogenization’.

Smith uses ‘the term imaginaries to address the Foundation’s conceptions of ‘development’ and its changing role in rice experimentation over time’ (142). She outlines her use of the term in a section on ‘Imaginaries and Representation’. This term can ‘highlight the ambiguities and normative content’ of the RF’s projects. She then briefly refers to existing literature on imaginaries to define the concept and how she will use it. Firstly, an imaginary is a ‘particular, often complex view of the world that comes to shape agendas, research trajectories, projects, and policies’ (462) pointing us here to Taylor (2004) and Anderson (1991). Next she tells us 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’ (ibid), quoting Appadurai (1996) that it is an ‘organized ﬁeld of social practices’. She then 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, telling us that ‘imaginaries are complementary to and overlap with the concept of ‘discourse’’, particularly as elaborated in the development studies literature, taking discourses as ‘institutionalized modes of representation’ the study of which can focus us on ‘the uptake of ideology into beliefs and actions’. Here we have mention of several concepts – discourse, ideology, representation – but it is not made clear exactly how these may differ, or how they relate to each other. One attempt is made by telling us 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). (*Here we are referred to Cullather, 2004*). Additional points are made about the imaginary, that it is ‘future-oriented, but also constrained by present and historically produced conditions, whether cultural, technical, scientiﬁc or political’ with Marcus (1995) being invoked here. 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’ (ibid).

Smith explains that there are ‘always multiple imaginaries at play in a society, and within institutions’ and that her study explores how ‘particular imaginaries emerged and prevailed through the RF’ in a way that enabled these visions to become seen to be the ‘best, most appropriate, or even inevitable—and how they became hegemonic while seeming apolitical or value-neutral’ (ibid).

Smith’s terminology here tends to slide between ‘imaginary’ and ‘representation’ without making it clear whether these terms are considered interchangeable or distinct, merely telling us that ‘representation is a key concept’.

This discussion leads on to an outline of her key findings – that the RF employs two predominant representational strategies of ‘paternalism’ and ‘homogenization’. These representational strategies are directed toward ‘both the scientiﬁc research objects under study—in this case rice— and the people thought to beneﬁt from this research’. Paternalism describes the way the foundation deems it necessary to intervene on behalf of human populations and food grains (463). Paternalistic representations include the very term ‘developing world’ which suggests a child like state, while even the term ‘orphan crop’ suggests an extension of this paternalism to rice itself (475). Homogenization represents both ‘rice’ and ‘the developing world’ as singular objects and subjects of intervention, allowing the use of a universal, generic and replicable set of tools, programmes and policies (463). The third world is represented ‘quite seamlessly as a unified space with common problems’ that can be solved through the foundations work on rice as a universalised object that can be improved via a central laboratory, a representation that elides more complex questions of diverse soils, climates and cultures (476). ‘Such imaginaries invite power to be transferred in one direction’ (475).

Therefore the foundations rice research reaches beyond being simply a series of agricultural experimentation projects rather ‘it is simultaneously a social and political project to extend particular modes of governance’ (463). For Smith: ‘I use the concept of ‘imaginaries’ to call attention to the modalities of governance through non-state institutions such as the RF. In this sense, ‘imaginaries’ functions as a mechanism of governance, in the way one might think of agenda setting in conventional political analysis’(463).

Smith concludes by noting how ‘imaginaries of development have history and politics’ (479). Between the early 1900’s and the 1980’s the imaginaries ‘projected and actualized by the RF found their roots in the early twentieth century and in later Cold War imperatives’, with the foundations ‘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. After the 1980’s this shifts to 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 her to ‘spotlight’ the ways in which ‘non-state actors who control the agenda for devising and implementing new technosciences participate in producing global politics’ (479). The RF 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 (ibid). Such agendas are conditioned by powerful imaginaries where global scale is given by the ‘constructed universalisms 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.

*Notes towards a discussion? Smith takes Jassanof and Kims ‘sociotechnical imaginary’ and applies it to an actor that is beyond any national or state bounded political sphere. What is lost and gained through this? The complex web between science policy, civil society, and the state that Jasanoff and Kim focus on with national sociotechnical imaginaries becomes less defined. But ‘imagined communities’ can indeed stretch beyond the national. Interesting to see how the imaginaries of technoscience can play a role in bringing into being new forms of community, in a way similar to Rabinow’s concept of the ‘biosocial’? How do imagined exchanges relate to or map onto practical, organisational and material ones*

## **Symbolic-interactionist approaches to imaginaries**

Hyysalo, Sampsa. 2006. Representations of Use and Practice-Bound Imaginaries in Automating the Safety of the Elderly. *Social Studies of Science* 36 (4): 599-626.

In this paper, Hyysalo argues for a particular way of conceptualising how professionals predict and prefigure the use of technology in design. The term ‘imaginary’ forms part of his conceptual apparatus, ‘Practice-bound imaginary’ (PBI), to examine user-representations in the construction of a novel healthcare technology for elderly people. The paper is structured as follows: explaining the concept of PBI; justifying its conceptual improvement on its predecessor, e.g., ‘Technological Frame’; applying the concept to a case study (i.e., ‘Wristcare’); and explicating the professional practices in which user-representations were created for Wristcare. In my commentary, I will address the following questions respectively: what is the problem that the author is addressing with the concept of imaginary? What work does the concept do in addressing this problem? What does the author understand by the concept?

Hyysalo’s description of the case study suggests that the concept of imaginaries is responding to the *complexity of participation* in technology design. Put another way, the author is trying to explain how different groups of professionals (engineers, medical experts, care-givers, etc.) produced and negotiated representations of the user in the design of ‘Wristcare’. The development of Wristcare, a wrist device for medically monitoring elderly people, is a story about ‘success and partial failure’. In the first part of the story, 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.

Another clue that the concept of imaginaries is responding to a ‘complex’ problem comes from the author’s comparison between PBI and TF. The latter 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, criticism of TFs is based on ‘the *sameness of meaning* in regard to the artefact as the defining criterion for ‘relevant social groups’’. This is probably opaque. Hyysalo is arguing that artefacts are not imagined uniformly by a ‘relevant social group’. The same groups could have conceivably different meanings which ‘often exist because of complementary resources, different starting points and meanings’ (2006: 603). The author repeatedly uses the metaphor of ‘sensitivity’ to justify the conceptual improvement he is proposing. By attending to the subtleties of ‘formations of joint action’ and ‘multiple participation’, Hyysalo believes that PBI might better understand the relationship between change and continuity. The following is worth quoting:

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 group’ and ‘TF’ have been conceptualized to date (2006: 604).

In the next paragraph, he asserts:

In contrast to TF, PBI 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). To summarise: PBI is a concept designed to cope with the complicatedness and messiness of social organisation in technology design; it seeks to capture subtle differences and fine-grain details within complex social organisation. In the tradition of symbolic interactionism, the concept of imaginary is oriented to understanding in more or better detail how user-representations (i.e., representations of *prospective use*) lead to successful design applications.

So, what is it about the imaginary that seems to address this problem? My hunch is that Hyysalo is making a productive connection between ‘imagination’ and ‘technology design’. The lineage he invokes to explain and justify the imaginary is pretty familiar territory. Here’s an extract from the paper:

The term ‘imaginary’ has recently become more popular in, for instance, cultural studies (Marcus, 1995), feminist theory (Stoetzler & Yuval-Davis, 2002) and Science and Technology Studies (STS) (Gregory, 2000; Suchman & Bishop, 2000; Verran, 2001; Fujimura, 2003). Like imagination it evokes both vision and fantasy, while emphasizing the corporeality and specific cultural and historical resources present in imagining (Suchman & Bishop, 2000: 327; cf. Stoetzler & Yuval-Davis, 2002: 322–27). While ‘imaginary’ is easily misunderstood as variously referring to image, imagination, imagery or the colloquial meaning of imaginary as ‘existing only in the mind’, associated with ‘free floating imagination’ (Verran, 2001: 37; Gregory et al., 2003: 3), **its appeal lies in the way it connects vision and fantasy to ways of perceiving and meaning-making**. As Michael Carter phrases it: ‘\*Imaginary+ is not a “thing” of the mind but of an overarching relation . . . the imaginary is not something which the subject calls up at will, or . . . slips into when the reality principle is lifted’ (Carter, cited in Verran, 2001: 37). Verran further defines imaginary in regard to land-right disputes in Australia, by saying that ‘an imaginary \*is that] through which the land is meaningful and by which the primary categories of that meaningfulness are given’ (Verran, 1998: 252). She refers to earlier work of Castoriadis, who defines imaginary as ‘the unceasing and essentially undetermined (social-historical and psychical) creation of figures/forms/images, on the basis of which alone there can ever be a question *of* “something”. What we call “reality” and “rationality” are its works’ (Castoriadis, 1987: 3; **bold** my emphasis).

The disciplines to which the term is linked are familiar and perhaps even a little superficial. The only surprises for me are the STS references to Suchman & Bishop (2000) and Fujimura (2003). I have highlighted the only novelty wherein Hyysalo appears to be bridging a connection between psychoanalytic understandings of the imaginary (‘vision and fantasy’) and symbolic interactionism (social interaction and ‘meaning-making’). I was particularly interested in some of descriptive and explanatory techniques he uses to ‘work up’ imaginaries as a concept:

* maintaining a resemblance to imagination
* *implying* a connection to psychoanalysis, e.g., ‘fantasy’, ‘reality principle’, ‘psychical’
* associating subjectivity with socio-historical, cultural ‘resources’
* associating subjectivity with corporeality, i.e., strong feminist theme
* accounting for misunderstanding, i.e., explanations of polysemy
* dissociating imaginary from mundane meanings
* reassigning psychoanalytic meaning to symbolic interaction, e.g., ‘meaning-making’
* invoking vague and prosaic descriptions, e.g., Michael Carter and Verran citation

My impression is that the version of imaginary being used here is much closer to the meaning of ‘imagination’: not imaginary as illusion or unreal, but socially constructed objects of the imagination. Hyysalo is using imaginary to describe the prospective envisioning work of professionals, that is, imagining users expectations and conduct to improve design. 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. Asking myself ‘what does the concept of imaginary add to the author’s problem?’, I’m not entirely convinced that other concepts could not accomplish the same task. This paper confirms my suspicion that the uptake of imaginary in STS is partly a fashionable phenomenon. But I do think there is an interesting relationship between the openness and polysemy of the concept and the complex nature of the problems to which it is being used. Maybe complex problems (i.e., problems with many actors and parts) benefit from concepts characterised by their openness and polyvalence.

## **Feminist approaches to imaginaries**

### *Haraway and technosicientific imaginaries*

Although she does not explicitly use the term ‘imaginaries’ Donna Haraway has become an influential figure beckoning her readers to decipher the imaginative dimensions of technoscience. Perhaps more than any other scholar she has shifted the STS focus towards the study of technoscience in popular culture and towards what would previously have been regarded as the ephemera of modern science (advertising, in particular). In both the *Cyborg Manifesto* (1985; 1991) and *Primate Visions* (1989) Haraway explored the variety of sites in which technoscience was being made.

Haraway also effectively excavates the imaginaries of technoscience by investigating the story-telling which constitutes modern science. *Primate Visions* (1989) was a study of the strands of story-telling that became embedded in the twentieth-century science of primatology. Indeed, story-telling became a leimotif of this book, as Haraway also examined the life-stories of those who were central to the making of primatology. A further reflexive spin was added through Haraway’s use of science fiction to raise questions about her own stories of the making of this science and to encourage her readers to conjure different versions of this science.

Chapter 4 of *ModestWitness –* ‘Gene: maps and portraits of life itself’is characteristic of Haraway’s mode of analysing technoscience imaginaries. She begins the chapter by examining the computer game, SimLife, which she contends encourages its users to position themselves as ‘scientists within narratives of exploration, creation, discovery, imagination, and intervention’ (Haraway 1997: 132). Haraway sees such narratives as deeply entangled in ‘Christian salvation history’ (Haraway 1997: 132). Narrative is identified as an important pivot of technoscience – in this case, in both computing and the life sciences.

Haraway is also interested in how modern technoscience *works visually* and this is another mode of her exploration of the imaginaries of science. This chapter revolves around Haraway’s readings of a set of visual texts (advertisements and cartoons) which represented modern genetics during the period of the Human Genome Project. This is complemented by an examination of the trope of mapping (with reference to Helen Verran’s and David Turnbull’s research)—a trope of visualization which was at the heart of the Human Genome Project.

This chapter shows Haraway investigating interpellation and the making of ‘technoscientific subjects’ through the imaginary of genomics (during the completion of the HGP) (Haraway 1997: 172). She offers detailed analyses of the SimLife computer game, Neibart cartoon advertisements, Sidney Harris cartoons, New England Biolab and the Logic General Corporation adverts. She shows that interpellation works through the mobilising of a repertoire of cultural resources and references (e.g. high art, Christian iconography), involving complex psycho-social processes, including investment and attachment. Humour is highlighted as an important vehicle in such interpellation, indicating that engagement with scientific imaginaries is not merely cognitive. Haraway provides a conceptual framing for her analysis by offering a theoretical bricolage, borrowing from Marx’s and Lukács’ notions of commodity fetishism, Freud’s theories of fetishization, and Whitehead’s conception of ‘misplaced concreteness’ (Whitehead 1948: 52; 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 the ‘technoscientific unconscious’ as at play 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 this 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 (Haraway 1997: 151). She is specifically concerned here 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.

‘The gene is the alpha and omega of the secular salvation drama of life itself’ (Haraway 1997: 133) Haraway observes. Her adoption of the label ‘secular creationism’ in characterising the contemporary life sciences is both jarring and humorous. This label seems to have been strategically invoked to disturb perceptions of this technoscientific field. Haraway uses irreverent humour to dislodge the hold of the imaginaries of contemporary genomics.

Haraway’s investigation of the ‘technoscientific unconscious’ demonstrates that technoscience is not exclusively about knowledge and cognition. She highlights how technoscience is constantly being made and re-made in the dispersed, often mundane, but always complex processes of formation of technoscientific subjects, that involve pleasure and anxiety. Narrative and figuration are the modes through which the technoscientific unconscious operates and these can be traced through a multitude of media. She maintains that we are all interpellated by these processes and thereby implicated as technoscientific subjects through diverse practices and encounters. Moreover, STS analysts are themselves not exempt from such interpellation. Hence, Haraway demonstrates that play, shock, and humour may be required to allow us to see the patterns of operation of the contemporary technoscientific imaginary.

### Waldby (1996, 2000)

## **The imaginary turn in STS: what’s it all about?**

Surveying recent STS research focused on imaginaries it is striking how often scholars specify their versions of the concept: ‘technoscientific’ (Marcus 1995), ‘geographic’ (Taussig 1997), ‘biomedical imaginaries’ (Waldby 2000), ‘future’ (Fujimura 2003), ‘scientific’ (Fortun and Fortun 2005), ‘practice-bound’ (Hyysalo 2006), ‘sociotechnical’ and ‘national sociotechnical’ (Jasanoff and Kim 2009), ‘of agricultural science and development’ (Smith 2009:478). This sometimes underscores empirical specificity. Taken together, such designation demonstrates that the deployment of the concept has not been restricted to particular fields. Some of this labelling may seem superfluous, since all instances considered in the STS literature examined above are technoscientific, social, and allude to futures. Nevertheless, emphasizing features does stress key aspects of analyses.

Tracing and analysing the diverse trajectories through which imaginaries have been pursued in STS has enabled us to suggest different registers of concern and modes of investigation in this work. Some researchers are concerned with professional technoscientific practitioners exclusively (e.g. Hyysalo 2006), while it is the ‘co-production’ of national technoscientific imaginaries (Jasanoff and Kim 2009) and corporate imaginaries (Smith 2009) that preoccupy others. By contrast, Verran (1998) and Strathern (2006) both venture outside of Western culture, to undertake trans-cultural analysis which, for them, makes the features of Western scientific imaginaries more discernible. Moving on from this tracking of differences and affiliations, the last section of this article is more speculative, as we reflect about what is and isn’t going on in STS engagement with imaginaries.

## *Practice: the lynchpin of STS work on imaginaries?*

Those venturing into the realm of imaginaries are often aware that they are susceptible to charges of idealism. Charles Taylor (2007: 31-2) dismisses such claims as ‘based on a false dichotomy, that between ideas and material factors as rival causal agencies’, claiming that ‘what we see in human history is ranges of human practices that are both at once… often inseparable, in the way described in the discussion of social imaginaries’. Likewise, Verran (1998) insists that imaginaries are located in practices, not minds.[[7]](#endnote-6) Hence, it is not surprising to find that many STS researchers link studies of imaginaries to analyses of specific technoscientific practices. These range from the practices of toxicologists (Fortun and Fortun 2005), to the processes of circulation in markets (Lee and LiPuma 2002), to those pertaining to property associated with the human genome (Strathern 2006). While insisting on the label ‘practice-based imaginaries’, Hyysalo (2009) studies the inter-disciplinary field of design and the concomitant assemblage of practices within that domain.

Nevertheless, anchoring work on imaginaries through reference to professional technoscientific practice has been neither uniform nor universal. Fujimura (2003) and Jasanoff and Kim (2009) view technoscientific imaginaries as national projects and projections, contending that they cannot be understood solely through reference to professional technoscience practices. Jasanoff and Kim (2009) are interested in the relationship between political institutions and technoscience. Their tracings are mainly textual, as they study policy documents, speeches and other documentation pertaining to public discourse. They also gesture towards other depositories in ‘mass media, popular culture, and visual materials’ which they contend ‘play critically important roles in the articulation of sociotechnical imaginaries’ (Jasanoff and Kim 2009: 122, n. 2), although they do not analyse such material themselves. While Smith is similarly orientated towards a broader attribution of the sources of imaginaries, she is eager to ‘spotlight’ the ways in which ‘non-state actors who control the agenda for devising and implementing new technosciences’ (in her own study those working in and around the Rockefeller Foundation) contribute to the generation of technoscientific imaginaries. For her, sociotechnical imaginaries may be generated outside the state-scientific communities nexus. While the focus of their concerns differs, Jasanoff and Kim (2009) and Smith (2009) ‘use the concept of “imaginaries” to call attention to the modalities of governance’ (Smith 2009: 463).

## *Imaginaries and reforming or transforming STS*

Work on imaginaries has often been part of a critical or reformist impetus within STS itself. This takes a relatively modest form with Hyysalo’s (2006) contention that the employment of the concept of practice-bound imaginaries (rather than the widely-used notion of technological frame) would encourage more sensitivity in analyses of technoscientific practices. More ambitiously, Marcus (1995: 7) proposes that pursuing imaginaries as they emerge in tensions between discourses and practices in technoscience, could lead to ‘a completely transformed and vast field of inquiry on which a distinctly cultural study of science might establish itself’. Jasanoff and Kim (2009) juxtapose their notion of ‘sociotechnical imaginaries’ with Marcus’s ‘technoscientific imaginaries’, urging STS scholars to cast their gaze beyond professional scientific actors and communities, towards institutional and state policies and the investigation of national cultures of technsocience. By contrast, working within similar parameters, Smith (2009: 479) foregrounds the study of ‘non-state actors who control the agenda for devising and implementing new technosciences… in producing global politics’ (479).

Moreover, some scholars regard the concept of imaginary as a pivot for STS intervention into the natural sciences. Fujimura (2003) suggests that social scientists should be developing sociologies ‘of the future’, seeking to ‘intervene in the envisioning of futures before they are materialized by other more powerful actors’. Fortun and Fortun (2005) speculate about the prospects for a new ‘civic science’ of toxicology and about a new model of STS, entailing, ‘ethics and friendship with the sciences’, which would enable co-operative recasting of imaginaries.

## *The turn to imaginaries: other dimensions*

What else is at stake in the STS take-up of the concept of imaginaries? The use of the term imaginaries moves the analysis of science away from a preoccupation with logic and epistemology, to the domains of aesthetics, values and emotions. It also signals a shift of attention from fact and artefact generation to storytelling and imaging in and around technoscience. These shifts align technoscience more closely with other cultural forms and open up a repertoire of new tools to STS researchers.

The pursuit of imaginaries marks a renewed interest in exploring the normative aspects of technoscience. The concepts of interests and ideology were markers of earlier STS work on technoscience and values. We might note: that these terms are connotatively more reductive than imaginaries; that ‘interests’ tends to imply personalized stakes; and that ‘ideology’ is strongly linked with Marxism. Each of these factors are significant in the take-up of imaginaries, given that complexity, multiplicity and dispersed agency have been watchwords in late twentieth-century and early-twenty-first century STS.

The emergence of imaginaries has not merely been a matter of terminological displacement or replacement. Nevertheless, STS scholars have tussled with the relationship of imaginaries to a range of other concepts, including ideology and discourse (see also Jasanoff and Kim 2003; Hyysalo 2009). There seems to be some agreement that imaginaries is a far broader concept than either ideology or discourse and that the latter terms may be employed within discussions of imaginaries. Indeed, some find the concept of imaginaries too broad and all encompassing. So, for example, Haraway advocates more precision in designating the registers of the imaginary.[[8]](#endnote-7)

All the research considered in this article questions the fact- value distinction instantiated by Kant, which has informed and shaped much popular and academic thinking about science since his time. Indeed, as noted previously, some STS commentators regard the explicit *denial* of *imaginaries* as the defining feature of Western science and of Western culture (Verran 1998; Squier 2004). Verran (1998) most clearly articulates this, proposing that such disavowal is a marker of epistemic privilege and that it requires continuous reiteration. Likewise Waldby (2000: 136-7) draws attention to the way medical and other sciences base their ‘claims to technical precision on a strict referentiality, a truth derived from the givenness of the object’ while the [biomedical] imaginary derives its ‘ impetus from the fictious, the connotative and from desire’. Squier (2004: 15) pursues a similar argument when she notes ‘the investment science has in the marginality and obscurity enabled by those discursive modes’ associated with imagery, metaphor, and the imaginary. Likewise, in comparing the imaginary embodied in New Ireland practices around the Malanggan with the Western imaginary emerging in the practices associated with the human genome, Strathern (2006) explores Western values of property and innovation. Haraway (1997) employs play, shock, and humour in her efforts to render the contours of the ‘ unconscious’ of late C20 genomic science visible. The analytical drive in her work is not only to make these imaginaries discernible, but to disrupt their hold. In each case the invocation of imaginaries is designed to elicit reflexivity about the norms and values of Western science and societies.

## *The realms of fact, fiction and fantasy*

There are two further striking features of the STS turn to imaginaries, which brings us back to our genealogical tracking. In this article we have identified seven modes of approach

to imaginaries: science fiction, psychoanalytic, anthropological/ethnographic, socio-political/institutional, symbolic interactionist, and feminist. Returning to our genealogical mapping, we could observe that, with a few notable exceptions, there has been limited engagement with either science fiction or psychoanalysis in STS work on imaginaries. In this regard, Haraway’s (1985, 1993) advocacy of SF as a neglected, rich resource for exploring the imaginaries of technoscience is an important marker for STS. Nevertheless, while some feminists have responded to her call (Squier 2004) and turned to SF in their investigation of technoscientific imaginaries, this constitutes a thin thread in STS work on imaginaries.

Despite the blossoming of interest in imaginaries and its genealogical connection with psychoanalysis, there has also been limited engagement with psychoanalysis within STS. This is not to say that researchers have not announced an interest in desires, fantasy, images, etc.-- all of which have psychoanalytic resonances. We may note that Haraway (1997) clearly invokes psychoanalysis when she refers to the ‘unconscious’ of genomic science, as does Verran (1998) when she insists on the problems in the denial of scientific imaginaries. Both Waldby (2000) and Squier (2004) do borrow and adapt some psychoanalytic framings. Nevertheless, in terms of citation and substance, engagement with psychoanalysis has been limited. There has been some discussion of fantasy, but little attention to the modes of how imaginaries actually work—particularly with reference to subject formation. Haraway (1997) alludes to interpellation in analysing genomic imagery. Fortun and Fortun (2005) mention subject formation in analysing toxicology, but here their only reference is to Sharon Traweek’s anthropological study of physicists. As yet, subject formation inside or outside of technoscientific communities has garnered little attention in STS research on imaginaries.

The apparent reticence to engage with science fiction and psychoanalysis may indicate unease about bringing approaches so strongly identified with fantasy and subjectivity into analyses of technoscience.[[9]](#endnote-8) The epithets ‘mere fantasy’ and ‘merely subjective’ seem to conjure the dilemmas facing those working on imaginaries in STS. On the one hand, they may be inclined to legitimize their work on imaginaries by pronouncing that these are not matters of ‘mere fantasy’ or ‘merely subjective’. Nevertheless, in so doing, they a closing the door on rich veins of the concept.

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1. Gibson is probably best known for the novel *Neuromancer* in which he coined the term cyberspace. [↑](#endnote-ref-2)
2. I will leave for another time detailed discussion of the potential homophobic connotations of such a descriptor. [↑](#endnote-ref-3)
3. Clute and Nicholls are credited as editors on the book cover. A third contributing editor, Brian Stableford is listed inside the book on the publication details page. [↑](#endnote-ref-4)
4. The literature search was conducted using Web of Science and a manual search of journals in which STS is regularly published. This list of journals included: Configurations, Science Communication, Science as Culture, Science Studies, Science, Technology and Human Values, Science, Technology and Society, Social Studies of Science. The WoS search helped to identify an additional reference in the anthropology literature. [↑](#footnote-ref-2)
5. a [↑](#footnote-ref-3)
6. We eliminated one of the articles because it does not use ‘imaginary’ conceptually. Barbrook (2007) uses the term as an adjective only. [↑](#endnote-ref-5)
7. The STS emphasis on practices resonates with the political philosopher Charles Taylor’s strong reaction to charges that the invocation of ‘social imaginaries’ ‘smacks’ of idealism. Taylor views such criticism as based on ‘a false dichotomy, that between ideas and material factors as rival causal agencies’ and he notes ‘ranges of human practices that are both at once, that is, material practices carried out by human beings in space and time….and at the same time, self-conceptions, modes of understanding’ (207: 31-2). [↑](#endnote-ref-6)
8. 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….  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: 77-8) [↑](#endnote-ref-7)
9. We are reminded here of Evelyn Fox Keller’s (1992) attempts to use psychoanalysis to interpret the history of the emergence of molecular biology. [↑](#endnote-ref-8)