

# The Ultimate Measure of Success for Speculative Design is to Disappear Completely

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**Abstract.** In this paper, we discuss how the increasing prevalence of Speculative Design in educational, research and commercial contexts may reflect and nurture a challenge to the dominance of ‘scientism’. The successes associated with 20<sup>th</sup>-century modernism are now, in the 21<sup>st</sup>-century, key factors in the intractability and complexity of 21<sup>st</sup>-century challenges. Speculative and Design-led approaches offer practical means to break down such intractability but do so over relatively short timeframes. We argue that, if we adopt a longer-term perspective, then disrupting the dominance of scientism so that the benefits of Speculative Design are ‘built in’ rather than ‘added on’ is realistic and desirable. In exploring this proposition, we come to reason that the ultimate measure of Speculative Design’s success is to disappear completely.

**Keywords:** Speculative Design, Design Research, Epistemology, Consilience, Pragmatism, Scientism.

## 1 Introduction

This paper is a position paper that reflects on our engagement with Speculative Design in Universities including original research relating to the development of Speculative Design methods; applying those methods in interdisciplinary research projects; and teaching such methods at school, undergraduate, postgraduate, and professional levels. This experience has allowed us to witness the realities which motivate this issue, namely the increasing prevalence of Speculative Design (as well as its cousins Critical Design, Design Fiction, and so on) and the assemblage of associated questions. Such matters include how to manage assessment or describe the impact of speculations, debates around the most appropriate methods (or styles) in given circumstances, and the relationship between speculation, research, and design practice.

Investigating these issues through research publications such as this one, domain-focused conferences (e.g., the Design Research Society conference<sup>1</sup> or the Research through Design conference<sup>2</sup>), and through other cultural events (e.g., Primer<sup>3</sup> and the Uroborus Festival<sup>4</sup>) is reflective of a healthy and active community. Moreover, the

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<sup>1</sup> <https://www.designresearchsociety.org/cpages/conferences>

<sup>2</sup> <https://www.researchthroughdesign.org/>

<sup>3</sup> <https://primerconference.us/>

<sup>4</sup> <https://uroborus.design/>

sharing of experiences within our community is what will galvanise it, strengthen it, and help it to continually evolve and adapt to contemporary challenges. These are conversations that we have historically contributed through, aspire to continue to participate in, and believe demonstrate the vibrancy of the Speculative Design movement. We have gone to these lengths to make that clear because *this paper is a different kind of contribution*.

Rather than focusing on the finer points of Speculative Design methodology, drawing on specific examples of practice, or making an incremental theoretical contribution, in this paper, we discuss the relationship of Speculative Design to our society's dominant models of knowing. Those models of knowing, we posit, are most frequently tied to a positivist foundation, and sometimes stray into 'scientism' (the idea that the *only* reasonable lens on the world is a scientific one). We will discuss how Speculative Design relates to the tacit epistemologies of individuals, organisations, and wider society. Through this discussion, we construct an argument that advocates for a paradigm shift in the tacit understanding of epistemology, away from the positivism-infused perspective and towards one that is more informed by the type of insights that are emerging from the burgeoning Speculative Design community. The value of this paradigm shift would be in a move away from the dogmas of disciplinary silos and closer towards pragmatic and holistic views that are founded in consilience rather than contrast. The title of the paper refers to the realisation that, if it were to drive such a paradigm shift and become a foundational piece in a new epistemological landscape, then, arguably, the ultimate success for Speculative Design is to disappear completely and vanish into the mainstream.

The paper proceeds as follows; in section two we discuss the breadth of the Speculative Design landscape and we acknowledge the differences and similarities between related practices to articulate how the spectrum of Speculative Design and related approaches<sup>5</sup> relate to our argument. In section three we discuss what we should expect from these practices, exploring strengths, weaknesses, and how these relate to other forms of scholarship or inquiry. Section four positions Speculative Design (and related practices) in relation to scientism and positivism, exploring the pros and cons of different epistemic perspectives. The fifth section refers to the first parts of the paper to build the rhetorical argument for a knowledge revolution (one that is partly driven by the success of Speculative Design). The sixth and final section explores limitations, risks, and actions; exploring why this argument could be wrong, what risks the position could pose and suggesting what actions the Speculative Design community might take to progress this debate.

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<sup>5</sup> An observation raised in peer-review is our very broad interpretation of the term Speculative Design, and occasional conflation with other related practices. This footnote serves to acknowledge that observation, which we do not dispute. However, we offer the caveat that our broad interpretation is deliberate and serves as a rhetorical device to support the core argumentation of the paper, in particular by providing a unified counterpoint to positivism/scientism argument which is surfaced in section 4. It may also serve as a reminder that Design Research terminologies are, arguably, unavoidably ambiguous [24].

## 2 (Dis)ambiguating the Speculative Design Landscape

The use of parentheses in the subtitle of this section reflects the realisation that it is neither fruitful nor possible to fully-and-finally clarify the various constituents and sub-genres which make up, contribute to, and are related to a ‘Speculative Design Landscape’. Key terminologies which are relevant here are Speculative Design, Critical Design and Design Fiction. Each of these has spin-offs and variants, depending on how the terms are being used, and may also refer to the given concept in terms of being a method, theory, practice, aesthetic, and—almost certainly—other qualifiers besides. There are conflicting and diverse accounts of how these concepts came to be and applied so widely. Arguably Italian Futurism [16], Radical Design [12], Critical Theory [15], Science Fiction [6] and Design Science [43] all share evolutionary heritage with Speculative Design. However, it’s also the case that, as in nature where the eye has convergently evolved more than 40 times, aspects of these concepts have also evolved more than once. For example, the theoretical foundations of Design Fiction are, according to some accounts, entirely distinct from the theoretical bases for Speculative and Critical Design [34].

Noting the multitude of terms, Pierce describes the amalgam of them as “alternative design” for the sake of simplicity [38]. Such simplification is a necessary rhetorical manoeuvre, allowing a fuller discussion of the virtues the concepts collectively, without getting sucked into the largely academic distractions of the minutiae. In this paper, we adopt the same approach, but in keeping with the terminology of the issue, we settle on the term Speculative Design (or Speculative Design landscape, where that seems more appropriate). So, to be clear, when we use the term Speculative Design, we are referring to the constituents of the Speculative Design landscape, which includes Critical Design, Design Fiction, and a plethora of sub-fields that are too numerous to list verbatim.

While we are happy to adopt this summative stance on Speculative Design, it is worth considering some of the characteristics which unify the constituents; most significantly are the relationships to and between ‘Research through Design’, ‘Design Research’, and ‘Research’. These terms form a conceptual taxonomy into which the constituents of the Speculative Design landscape fit<sup>6</sup>. Speculative Designs “implicitly if not explicitly” [38] aligns with a Research through Design approach (a constructionist approach with design practice, making, and reflection at its core [23,28]). In turn, Research through Design is a subset of Design Research (which is a slightly broader canon including Design Methods, Philosophy of Design, and Design Theory). And, of course, all of these relate to Research. The term Research then poses another avenue for ambiguity when we consider it may mean the collation of existing information (e.g., “researching the price of hotel rooms”) but can also mean the production of new knowledge or insight (e.g., “this Research proves the existence of the Higgs Boson”). In the context of Art and Design Research, this point was neatly disambiguated by Frayling [20], and subsequent discussions note that Speculative Design invariably involves both types of research [33]. We would posit that, practically speaking—from

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<sup>6</sup> James Pierce’s recent paper, *In Tension with Progression: Grasping the Frictional Tendencies of Speculative, Critical, and other Alternative Designs*, provides an excellent purview of this taxonomy [38].

the point of view of student projects through to large academic or industrial research projects—Speculative Design is always about exploring a topic and discovering something about that topic. If we simultaneously consider this alongside the taxonomical argument (that Speculative Design is a type of Research through Design, which is itself a type of Research), then it seems that rarely—if ever—does Speculative Design take place without the underlying aim is to produce new knowledge or insight. So, filtered through the taxonomical funnel described above, anything that fits into the Speculative Design category implicitly fits into the Research category as well, where it sits alongside any other scholarly inquiry, whether that be in Astrophysics, Molecular Biology, Economics, or Philosophy.

Although the structure described above appears neat, and hopefully coherent, we also note that this coherence is an artificial overlay. We are striving to put forward a clear argument and to do that we must propose models or approximations of the true situation. Per footnote 5, we acknowledge that conceptually amalgamating Speculative Design with Research through Design, and artificially placing both in a broader Design Research and Research taxonomy is a bold conceptual manoeuvre. However, we ask that readers appreciate that this is a deliberate decision, and what we sacrifice in nuance is intended to promote and clarify the core argument. But the reality is that the Speculative Design landscape is contested, an attribute that is driven by inherent interdisciplinarity and diversity, and what emerges from this is a notable lack of permanent archetypes. But, “to move forward we need a mechanism to dynamically respond to the complexity [and] contestation [...] We should not see these properties as *problems* but as fundamental qualities; they are, in fact, strengths” [24]. That such ambiguity may be considered a strength (rather than a problem) is a keystone in the argumentation of this paper. These ambiguities, which drive an integral subjectivity and deliberate use of interpretation, are at once what enables Speculative Design to work so effectively, but also why it is perceived as novel and ‘other’.

### **3 ‘Knowing’ What to Expect from Speculative Design**

This article is overtly supportive of Speculative Design. We deliberately champion its qualities and go so far as to suggest it may contribute to a knowledge revolution. If taken without qualification this may appear swashbuckling, ostentatious, and maybe even arrogant. Hence, to add credence to our argument and—we hope—make it clear that our view of Speculative Design is, actually, humble and measured, we employ this section of the paper to acknowledge the bounds of what Speculative Design might reasonably achieve. For all its virtues, Speculative Design is not a cure-all; it is not a shortcut for all progress or an alternative to science, and its profundity is a product of accepting its limitations.

While succinct explanations for what kind of knowledge we might expect to result from Speculative Design are rare, relatively elaborate explorations of the question are comparatively common. Moreover, the interplays and overlaps between the constituents of the Speculative Design landscape (e.g., Critical Design, Design Fiction, Research through Design, etc) are relevant again; those methods, styles, and traditions influence one another. For that reason, there may be some elements of repetition in this

section as compared to section 2. What is different, however, is that although section 2 aims to disambiguate aspects of the Speculative Design landscape as they relate to each other, *this* section specifically focuses on the commonalities between how those aspects produce knowledge. Hence, our aim in this section is to highlight knowledge-production attributes that appear consonant or resonant with each other, but also to underscore types of knowing that *none* of the popular approaches aspires towards. In other words, we wish to balance a purview of what we might expect from Speculative Design, as well as more clearly stating what we definitely should *not* expect.

Anthony Dunne and Fiona Raby have been important figures in the rise of Speculative Design, through their practice, the pioneering Royal College of Art's Design Interactions programme, and writing foundational texts such as *Speculative Everything*. In *A/B*, by simply utilising pairs of words, they describe characteristics that denote how Speculative Design is different from how most people understand design. Normally design is affirmative, solves problems, provides answers, and is about consumers. Conversely, Speculative Design tends to be critical, finds problems, asks questions, and is about provocation [40]. When interviewed for *SpeculativeEdu* recently, Dunne notes that speculation has a long history of being used to sell things, for example, the role that concept cars play in the automobile industry, but his view of Speculative Design is about trying to “relocate this way of designing from a strictly commercial context into one where it could be used for other purposes” [25]. While Dunne and Raby have much more to say on the subject, the takeaways here are that Speculative Design *can* be deployed in a commercial context (e.g., in support of ‘trying to sell stuff’), but it can also—and perhaps is more frequently—deployed in a critical mode, to ask questions, raise debate, and help produce new understandings.

If we focus on the latter—Speculative design as a means to produce new knowledge—then it's worth considering what the underlying epistemological mechanisms are. Put differently, if Speculative Design helps us produce new understandings or insights, *how* does it do that? In a famous pamphlet, Sir Christopher Frayling delineates how research *for* a Design (i.e., background information needed to deliver a specific design process, such as ‘how many legs does this chair need?’) and Research *into* Design (i.e., understanding the history, traditions, and processes that Designers go through) are quite different from Research *through* Design. Research through Design (often referred to as RtD) is an activity driven by the pursuit of new knowledge, but where some kind of Design is the methodological apparatus in play. As noted in section 2, Speculative Design either explicitly or by implication tends to align with Research through Design [38].

The Human-Computer Interaction (HCI) research community is a vibrant home for the development of theory relating to Research through Design. In his account, Gaver describes RtD-derived theory as “provisional, aspirational and contingent”, which contrasts with theories derived from Popperian falsifiability that aspire to be ‘fixed’ or concrete. Instead, we should expect theory resulting from RtD to be ultimately particular [46:55–65] and highly context-dependent. Many such examples can be considered as broader research ‘programmes’ [4] and it can be through these amalgamated views that RtD programmes derive additional validity, and one might interpret their findings robustly. A resonant view is to consider theories as annotations to instances of RtD [23], a single Design example being used to demonstrate, explore, or test a theory. Consonantly RtD has been mooted as a viable means to run “practical”

experiments with contemporary philosophical positions such as Object-Oriented Ontology [32,35]. Multiple experiments of this ilk or collections of annotations can be reconciled into ‘portfolios’ [22,26]. In doing so RtD practitioners balance the inherent need for the plural perspectives and ultimate particulars of their outputs, with the not-unreasonable desire to make concrete, and valid, assertions based on their work.

Zimmerman, Stolterman, and Forlizzi have been influential in HCI’s interpretation of RtD too, describing RtD as “a research approach that employs methods and processes from design practice as a legitimate method of inquiry” [56]. Whilst this interest in developing formal methods has caused some disagreement with the Gaver position (that argues against homogenised process-led approaches to implementing RtD) there is little which fundamentally disagrees with the underlying epistemic engine, the nature of the findings, or the motivations for doing this kind of work in the first place. Such attempts to formalise RtD and describe it in terms of reproducible methods [55], or describe it in terms of a formalised epistemology [41] creates a paradox wherein work is expected to be simultaneously concrete and *not* concrete. The result is a kind of cognitive dissonance, or “anxiety” [34:55]. Calls to describe “what this method entails and what its outcomes might be” in order for “others to recognize the rigor and relevance of this approach” [56] and to triangulate RtD projects with “other data from the world [...] in order to avoid being a purely subjective and uncritical work” [41:2] are entirely understandable given the scientised world we live in (which will be discussed in more detail in subsequent sections of the paper). However, there is little to suggest that we will ever quell these anxieties; RtD simply *cannot* be legitimised, validated, made rigorous, or triangulated in the way which would be necessary. It creates a different kind of knowing, a different kind of knowledge—it is this way of knowing that Gaver described as “provisional, aspirational, and contingent” [23].

Nailing down the value of this kind of knowing has traditionally been something of a challenge for Speculative Designers and practitioners of RtD; the value is evident and intuitive, but is interpretable (i.e., it may be different for any given individual) and based on conjecture (which is traditionally the enemy of *knowing* in the sense we usually mean it). Odom et al., note that in the context of understanding how we use computers, much research has moved away from how to design for “efficient” use and towards understanding the “complex matters of human-technology relations that often involve messy, intimate, and contested aspects of everyday life” [37]. It is these ‘messy’ situations that Speculative Design is fit for. And, as discussed at length by the Sociologist John Law, the mess of the real world demands equally messy (and flexible) research methods [30,31]. Lindley, Coulton, and Sturdee describe how Speculative Design can be deployed in order to try and elicit insights which have the richness and quality of long-term fieldwork such as ethnography, but do this pertaining to a near-future possibility; their caveat, of course, is that we must accept speculation cannot predict exact futures, but it can “focus the plurality of multiple possible futures that are before us, such that they can be better critiqued from the present” [36]. While acknowledging some etymological baggage in the term ‘speculative’, Auger reinforces this view of the type of knowledge Speculative Design brings to the table; that it is “based on questions and discourse” enables us to think about what we *don’t* want as much as what we *do* [2]. Tonkinwise—who has been a vocal critic of the Speculative prefix to Design, arguing that all design should do this anyway [49]— identifies a unique but valuable aspect of Speculative Design as “argumentation and persuasion”

[25]. In the opening passages of *Speculative Everything*, Dunne and Raby describe the value of Speculative Design as “the idea of possible futures and using them to better understand the present” [16:2].

In summary, Speculative Design—and Research through Design, to which it is unavoidably linked—produce a variety of ‘soft’ kinds of knowledge which are: subject to change; highly contextual; asks questions; doesn’t provide answers; intends to be rhetorical; aspires towards messy accounts of social situations. The processes by which this knowledge is produced are quirky too: they resist being turned into a methodology; they derive value from interpretability (*not* reproducibility); they can be used both to test and produce theory; they are a natural by-product of Design, but when applied in a Research context provide a unique (and otherwise hard to attain) way to better understand the world we live in.

If we reflect on the content of this section, common sense suggests that Speculative Design does not embody traditional notions of science (e.g., falsifiability, reproducibility, use of methods systematically). And yet the reason that Speculative Design is a growing movement, why it is taught in Universities, why it is practised widely, and why we are writing *this article*, is that it helps refine and focus our knowledge about the world. But Speculative Design *is not science*. The kind of knowledge produced by Speculative Design will not solve mathematical equations, or describe how chemical reactions work, nor will it prove beyond doubt the existence of fundamental particles. But, conversely, maths, chemistry nor physics will not—alone—create the soft and messy insights that Speculative Design does. Hence, Speculative Design’s utility is to help us make sense of the messy, fast-paced, technological, and globalised world, and *that world is a product of science*.

Hence, whilst these two contrasting ways of making sense of the world are hard to reconcile epistemologically, Speculative Design is clearly an irrelevance without the impact of scientific achievement. Conversely, the difficulty of understanding the far-reaching (and fast-paced) impact of scientific achievement is precisely why we need Speculative Design. Philip Sidney’s rousing “Defence of Poesy” (1595) re-affirmed the value of poetry in the face of prevailing counter-currents within aristocratic Elizabethan society; resonantly we are advocating a “defence” of Speculative Design, acknowledging that we are also doing so in the face of some prevailing currents in the early 21<sup>st</sup> century.

#### **4 The Dominant Paradigm is Positively, Scientifically, Certain**

The virtues and nuances of Speculative Design aside, we live in a world that is dominated by other ways of looking and knowing. Before we discuss some of these perspectives, we must reiterate that this is a paper *about* Speculative Design and hence this section is very much a rhetorical device in order to frame insights that pertain to Speculative Design. In the following, we will touch upon some complex and challenging topics including Positivism, Scientism and Certainty and it is likely that some of our treatment of these areas will be imperfect, but, when considering critique of how we present these concepts, please remember their role in terms of the paper’s

contribution (i.e., as a rhetorical device to frame our position as it relates to Speculative Design).

As discussed in section 3, attempts to protect Speculative Design and RtD from accusations of being ‘purely subjective’ and to recognise the ‘rigour and relevance’ of the approach have been described as exhibiting ‘anxiety’. This angst, in our view, is the result of a category mistake. The reason for this mistake is the prevalence of organisational structures and societal assumptions which seek certainty. That aspiration for certainty manifests itself in many ways, which, depending on the context we could refer to as Positivism, we could refer to as Science, or we could refer to pejoratively as Scientism. We will draw upon several examples to illustrate how this aspiration for certainty manifests in the world, and what its relationship to Speculative Design is.

Let’s imagine some jobbing Speculative Design researchers, working in a University context, as an example. One structure they must operate in and around is funding bodies (e.g., UK Research and Innovation, the European Commission, or The National Science Foundation). The review processes for applications to such bodies tend to require elements of certainty—for example relating to specifically what methods will be applied and what research questions each method will address. Similarly, once a Speculative Design project is underway, there is likely to be an expectation that a specific *answer* will be found to the question that the project set out to address. Assuming our researchers got this far and wish to publish their work, there is a well-understood bias towards publications that report positive or affirmative results (publication bias). In each of these cases, there is an uncomfortable fit between the reality of Speculative Design and the reality of the system it is plugging into. The driving factor here is a tacit assumption that certainty is the best outcome, which, in reality, isn’t always the case [54]. If we look to other examples, it becomes evident that the phenomenon does not *only* apply to funding councils and publication; this penchant for certainty is, in fact, ubiquitous and touches most aspects of society.

Although it is ubiquitous, our desire for certainty is largely tacit—that is, we tend to assume that being ‘certain’ about any given situation is both possible and desirable [18:1]. The process by which certainty became so engrained has its roots in the Enlightenment [53:13–44] and it has evolved over several centuries, hence it is somewhat tricky to unpick, but we aspire to highlight some aspects that are salient to our argument here. During the Enlightenment, key figures—e.g., Galileo Galilei, Johannes Kepler, and Isaac Newton—began to explain aspects of the physical world in entirely new ways. Cycles of hypothesis, experimentation, and revision (what we now refer to as the Scientific Method) entirely disrupted the theist dogmas of the era. If we put that in context, disrupting the might of the Catholic Church’s dogma in the 17<sup>th</sup> Century *was not easy* [3]. The reason this was possible at all is because of the overwhelming weight of evidence; it became impossible to refute the facts and we could be ‘certain’ that the geocentric theory held by the Church was wrong. This ability for reason to overcome an opposing view held by something as powerful as the Church laid the foundations for a kind of fetishization of science.

Philosophical thinking was also being revolutionised during this time, including the philosophy of knowledge itself. Among many other contributions, Francis Bacon and René Descartes laid the foundations of inductive and deductive reasoning, respectively, which, by the time the 20<sup>th</sup> century came around had evolved into healthy and advanced debates about epistemology. This point in history is key to our account of how certainty



became so integral to the world: the fruits of scientific labour were transforming the world more rapidly than ever as part of the industrial revolution; the transformation of the Enlightenment was recent history; epistemology and philosophical thought were more advanced than ever. Around the same time the Logical Positivism movement (also known as Logical Empiricism) began to flourish, and the notion that it is only provable statements that are meaningful was tabled. While the purest form of Logical Positivism is largely extinct, the concept of *Scientism* is arguably a contemporary descendent. We note that scientism itself is a word with multiple meanings, but the specific meaning we are referring to here is that “only what can be established scientifically is true, objective, and valid everywhere and for everybody” [52].

Casting our mind back to our Speculative Designers trying to get funding for their project, the reason that there exists a dissonance between what they want to achieve and the realities of delivering it is that the systems they are trying to fit into are infused with attributes of this history; almost anywhere we look, aspects of positivism and scientism are at play. These worldviews are the dominant paradigm. There are countless examples of how they manifest in the world. For example, professional trade bodies (e.g., the General Medical Council) utilised standard and ‘verifiable’ measures to ensure the services their members provide are adequate. Regulators (e.g., the Office for Standards in Education) produce ‘objective’ accounts of how well schools are performing. And, during the Covid-19 pandemic, governments frequently stated they would ‘follow the science’ when determining what policies to implement. However, if we take a closer look at these examples, it’s entirely possible for a member of the General Medical Council to be ‘verified’ as providing an adequate service and yet be bad at their job because they are insensitive or have no bedside manner. It is possible for an ‘objective’ account of a school to show it as drastically underperforming, even though the reality could be that the school in question is excelling in a challenging socio-economic environment. And, whilst the governments may attest to ‘follow the science’, policy decisions are never decoupled from ministers’ own values, judgements, and political priorities—not to mention the fact that ‘the science’ was, irrefutably, producing uncertain results. Each of these examples assumes that certainty is both attainable and desirable. We suggest that they are unlikely to be attainable, and may or may not be desirable, but the key assertion which we need to highlight is that attributes of scientism and positivism (which manifest as a desire for certainty) are present in the dominant societal paradigm.

To give yet another view on this situation, but one that ties neatly back to our discussion of Speculative Design, it is worth noting that the separation of the arts and the sciences is a relatively recent phenomenon, for example as recently as the 18<sup>th</sup> century what we now refer to as the science of Biology was referred to as *Natural Philosophy*; in a lecture at the Royal Society in 1836, John Constable noted that “Painting is a science and should be pursued as an inquiry into the laws of Nature. Why, then, may not landscape be considered a branch of natural philosophy, of which pictures are but experiments?” [9 cited in 20] and, any close analysis shows that stereotypes suggesting that there is zero common ground between the practices of art, science, and design is undermined by the weight of examples from history [20]. What drove this separation in educational contexts was not a fundamental disagreement between the arts and the sciences but was an immediate need for specialization in the 18<sup>th</sup> and 19<sup>th</sup>

centuries; we needed to develop specializations in order to drive the industrial revolution.

To summarize, we live in a world where the dominant paradigm tends to strive towards certainty. Our collective clamoring for certainty is a hangover from how various spin-offs of the Enlightenment interact with one another—including the achievements of science, the notion of positivism, and the conflation of these into a latent scientism that lurks in most facets of society. Realizing that this notion of certainty is not *always* achievable, or desirable is not in opposition to any scientific viewpoints and is not meant to undermine the value of science in the slightest. As we noted at the start of this section, the whole purpose of this discussion is as a rhetorical device to support and frame our broader argument as it relates to Speculative Design. The crux of that argument is as follows; certainty, positivism and scientism are pervasive; they are also incompatible with Speculative Design. Hence, as we explore in the following section, reconciling that incompatibility is arguably a key factor influencing how the virtues of Speculative Design can be exploited in the future.

## **5 Ways to Disappear; From Consilience to Pragmatism**

Thus far the paper has built the foundations of an argument for action around how we talk about and teach Speculative Design. First, we acknowledged and explored the inherent ambiguity of Speculative Design. Then we unpacked the sort of outputs and insights we can reasonably expect Speculative Design to produce. Finally, we explored in what way Speculative Design is ‘other’ to the dominant knowledge paradigm. In this section, we will go on to describe reasons why, in the face of the 21<sup>st</sup> century’s unique challenges, we might aspire to assimilate Speculative Design’s attributes into normalised ways of making sense of the world. If such a shift were achieved, then, we would stand the best chance of reaping the rewards of Speculative Design approaches and applying their insights to the complex and rapidly shifting socio-technical landscape we live amongst.

Writing in 1970, in their book *Future Shock* Alvin and Heidi Toffler describe how in the future “too much change in too short a time” can result in individuals and entire societies experiencing a kind of social paralysis [48]. The phenomenon, they said, would emerge from too much choice, disposable culture, and the fickleness of celebrity. While there is much the Tofflers got wrong (e.g., disposable paper clothing) many of their predictions do resonate with the modern world (e.g., the Internet and the decline of manufacturing in the West). The eponymous Tofflerisms include quips such as “Change is the only constant” and “Technology feeds on itself. Technology makes more technology possible”—sentiments which seem self-evident if we consider the smartphone is still less than 20 years old, and the rate at which Machine Learning techniques are improving is astonishing.

Hence, the Futurism of the 20<sup>th</sup> century has become the reality of the 21<sup>st</sup> century. Exploring how society and technology co-evolve with one another, James Bridle notes the chasm between our ability to understand the technologies that punctuate our lives, and their ability to impact upon us:

*Over the last century, technological acceleration has transformed our planet, our societies, and ourselves, but it has failed to transform our understanding of these things. The reasons for this are complex, and the answers are complex too, not least because we ourselves are utterly enmeshed in technological systems, which shape in turn how we act and how we think. We cannot stand outside them; we cannot think without them. [8:2]*

Bridle goes on to explore various metaphors for the challenges we face when trying to interact and live in the socio-technical quagmire of the modern world. We need not only the language of the systems we live among, but their *metalanguage*; we need to see the pipework which surrounds us, but also to learn to do the plumbing; we should not allow the term ‘cloud’ to hide the hard, tangible reality of the data centres and infrastructure it describes. The theme which runs through Bridle’s dissection of today’s technology is, rather like the Toffler’s, one which describes the tensions of the unknown and they both balance an excitement for what we can do with technology, the cautionary notes on what might happen if we fail to learn to understand it: “How we understand and think our place in the world, and our relation to one another and to machines, will ultimately decide if madness or peace is where our technologies will take us” [8:11].

The Tofflers and James Bridle offer but two of many perspectives on the enmeshed challenges of making sense of a rapidly changing technologically mediated world. The Anthropologist Sherry Turkle notes the devaluation of physical experience and increasing isolation that hyper-connectivity brings [50]; Jaron Lanier cites the unavoidable lure of the “siren servers” (large internet corporations which we cannot live without) [29]; whilst Bruce Sterling realises how control over the fabric of our cities is concentrated in private hands through the Internet of Things [45]. These accounts of our changing world represent various forms of a problem statement, where the problem is how do we make sense of our rapidly changing world? By deliberately exploring and building alternative imaginaries, Speculative Designers have begun to provide alternative solutions and theoretical frames to respond to the problem.

These are manifest in a wide variety of research, all of which explores the socio-technological precariousness which surrounds us. For example, contemporary Philosophies of Technology such as Postphenomenology [44] have been deployed in combination with Speculative Design, specifically to unpack rapidly changing human-technology relations [26]; in a similar manoeuvre Object-Oriented Ontology and Speculative Realism [cf. 7] are increasingly cited as conceptual “jumping off” points for Design-led research enquiries [32]; meanwhile, the New Materialist turn in the Humanities opens up a similarly non-anthropocentric set of perspectives [19,21]. These experimental viewpoints are underpinning a move away from 40-year-old Human-Centred Design principles towards *More-Than-Human-Centred Design* [11,51]. Speculative Design has found its way out of the art gallery [25]. Increasingly conference events exploring the intersection of society and technology *specifically* ask for Speculative Design contributions (e.g., GROUP<sup>7</sup>, NordiCHI<sup>8</sup>) and there has been a huge growth in publications based on Speculative Design over the last decade.

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<sup>7</sup> <https://group.acm.org/conferences/group22>

<sup>8</sup> <https://nordichi2020.org/case-studies>

Elsewhere, Speculative Design's use in public policy contexts grows (e.g., Open Justice<sup>9</sup>) and Google infamously leaked a dystopian Speculative Design project from their X laboratory<sup>10</sup> (this was a Public Relations fiasco, but useful to demonstrate the use of Speculative Design in the private sector).

To summarise; the world is *Future Shocked*, change is the only constant, the rate of change continues to accelerate and to keep pace we need to constantly develop new ways to look at the world. Speculative Design is demonstrably answering that need in a multitude of different ways. Whilst this is arguably a great success for the Speculative Design movement, we argue that the 'otherness' of Speculative Design—stemming from its incompatibility with the dominant knowledge paradigm—prevents its full potential from being realised. Therefore, the more we can nudge Speculative Design into the mainstream the more we can take advantage of its ability to help devise preferable and practical responses to those far-reaching, cross-cutting challenges which we face in the 21<sup>st</sup> century.

In the remainder of this section, we will explore some conceptual frameworks by which we might achieve Speculative Design 'by default'. To be clear, and to reiterate some of the concluding remarks of section 3, we do not suggest that Speculative Design should—alone—become the default means of making sense of the world. To suggest that would reject the rich tapestry of means we have at our disposal to make sense of the world from statistical analyses of data, via qualitative analyses of people, to observations about the cosmos and particle physics. Rather, we are suggesting that Speculative Design should become a normal and not-unexpected tool in the box of available methods. The first, and the most obvious, and the least taxing method by which this shift might take place is by osmosis; the natural assimilation of ideas from one part of the world to another. The growth and adoption of Speculative Design thus far is largely attributable to this kind of osmosis, but it has seen publications including the keywords 'Speculative Design' or 'Design Fiction' increase by roughly 10% per year for each of the last 10 years; growing from around 230 publications in 2010 to over 2300 in 2020<sup>11</sup>. We can assume that this osmosis will continue to some extent, it may accelerate, and may accelerate outside of the academic space which the numbers above refer to. But what if we were to assume that we don't want to wait for this to happen naturally, and wish to consider how we might positively impact this adoption more quickly? In such a scenario what other framings can we consider that use ideological, methodological, or epistemological arguments to *proactively* drive an increase in the adoption of Speculative Design?

One such approach is the idea of *Consilience*; or the idea that we should aspire towards fundamental principles which unify all knowledge. Wilson's framing of Consilience is overtly reductionist and aligns to some traits of scientism, building from the assumption that the *natural laws* of the Universe that will ultimately describe everything in it. But, alongside this rhetoric which would seem to go against the

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<sup>9</sup> <https://openpolicy.blog.gov.uk/2019/11/01/using-speculative-design-to-explore-the-future-of-open-justice/>

<sup>10</sup> <https://www.theverge.com/2018/5/17/17344250/google-x-selfish-ledger-video-data-privacy>

<sup>11</sup> These figures are based on the search query "*Speculative Design*" OR "*Design Fiction*" in the Google Scholar search engine; these figures are subject to change and simply serve to represent an indicative increase in publications relating to Speculative Design.

argument we have laid forth thus far, he also says there “has never been a better time for collaboration between scientists and philosophers, and we are approaching a “new age of synthesis” [53:11]. Whilst there is a very scientific leaning in Wilson’s approach—e.g., stating the goal of “turning as much of philosophy as possible into science” [53:12]—there are two underlying sentiments which resonate with our discussion of Speculative Design. First, the realisation that condemning human efforts to isolated silos will ultimately be harmful, “Every college student should be able to answer the following question: What is the relation between science and the humanities?” [53:13]. As this relates to Speculative Design, perhaps every student—whether in Art, Philosophy, Ethics, Computing, or Physics—should be able aware of the relationship between Speculative Design and the wider world? Next, Wilson’s approach to arguing the case for Consilience resolves around arguing the links and mutual interest across seemingly opposed or incompatible ways of thinking (e.g., Postmodernism and Science, or Reduction and Synthesis). Once again we might learn from this too, as practitioners and teachers of Speculative Design, use examples from our practice and from history to show how Speculative Design relates to and crosses into all the disciplines and areas of interest that it does (the impact of Futurama on the landscape of the United States [1], or the change in public perception relating to artificial hearts after appearing in fiction are two interesting examples of this [27]). The allegiance to Scientism makes it difficult to reconcile our argument with Wilson’s view on Consilience, notwithstanding this misalignment the belief that the arts and the sciences are stronger together, and that clarifying the nature of this relationship *is* consistent with our position. Moreover, we might learn from the prosaic but well-defensible approach to arguing the case; referring to examples of where Consilience has been achievable and has produced desirable outcomes. *That* is an entirely tenable approach to take for demonstrating the value of Speculative Design as it relates to other disciplines, challenges, or projects.

An alternative conceptual frame we might apply is *Pragmatism*; deciding on a course of action based on practicalities rather than theory, philosophy, or other assumptions. Robson explains how pragmatic research approaches can address a wide variety of questions, provide researchers with flexibility, encourage collaboration across disciplines, and allow the conception of research as a “holistic” endeavour [42:171]. The flexibility which is part and parcel of pragmatism is, arguably, an integral feature of Speculative Design already. The ability to thoroughly explore the problem space and not commit too soon to a solution is a trait of all Designers [14], and is a necessary attribute of a pragmatic approach. Moreover, a fundamental property of Speculative Design is its interdisciplinarity (and “multi/cross/trans/alter” disciplinarity [43])—Speculative Designers borrow from other disciplines routinely, which goes some way to explaining why they frequently don’t identify as Designers themselves [24]. Speculative Design is about synthesis, and connectivity; “[it] acts as an element not of division but of cohesion” [25]. So, as a conceptual framing for Speculative Design, pragmatism is a natural fit. The challenge, then, is to demonstrate to the rest of the world the inherent value of wilfully crossing disciplinary boundaries [5], and perhaps pragmatism is the vehicle to carry Speculative Design along that journey. An attraction of pragmatism in this sense is that it may allow individuals or communities with particularly strongly held beliefs about what constitutes a valid philosophical view of the world to maintain those beliefs, but under the auspices of pragmatism to entertain

and be exposed to the qualitatively different proposition that Speculative Design may offer.

Our brief explication of Consilience and Pragmatism is intended to show some mechanisms by which we might argue for the inclusion of Speculative Design in ‘traditional’ research-based views of the world (e.g., as part of a public health project exploring how wearables impact wellbeing, or a qualitative study of public attitudes toward a new congestion charging zone). However, so far, we have neglected the paper title’s claim that the *Ultimate Measure of Success is to Disappear Completely*. Why should a success metric for Speculative Design be to disappear?

Given the lengths we have gone to construct the argument, the logic of this disappearing act is mercifully brief: Speculative Design is a resource that is useful *in general terms* (as are arithmetic, linear regression, and psychology). Its value is broadly demonstrable, and it is viable to integrate aspects of it into other views of the world. If all this is true, then we should aspire to be judged by the same criteria as (to recycle the examples) arithmetic, linear regression and psychology. If Speculative Design does not achieve an equal footing like this, then its benefits and virtues will always be limited. It will take some time to achieve this shift, but given the health, breadth, and continued growth of the Speculative Design movement, we suggest it is a shift we should aspire towards from *now on*. Hence, whilst we argue the *ultimate* success for Design Research would be to disappear completely, a more achievable and shorter-term goal might be to shift the trajectory of the dominant paradigms by just a few degrees now, such that in 5-, 10-, or 20-years’ time a larger shift will have taken place.

## **6 How to Disappear: Actions, Risks, and Limitations**

The paper up until this point has constructed, we hope, a clear argument for why Speculative Design should and could cease to be a fringe activity, and instead become a normalised part of the dominant knowledge paradigm in both Teaching and Research agendas, across a wide range of subject areas. In this final section, we will introduce some practical actions Design Researchers and educators might take towards that aim, as well as unpacking some risks and limitations.

The most powerful and impactful actions we can take to respond to the argument in this paper are likely to come through how we teach Speculative Design. Upon the fertile Speculative Design landscape, there is much agreement and occasional points of divergence, however, the points laid out in this paper—we suggest—apply almost universally across the gamut, notwithstanding the divergence. We are making general points which, whatever flavour of Speculative Design you prefer, are relevant. And these general issues are relevant to how students who we have taught Speculative Design might later deploy it in the world. We argue that it is our responsibility as educators to contextualise the methods and techniques we are passing on to students *complete with* an account of how these techniques fit into wider societal structures including the notions that we have referred to in the paper as the dominant knowledge paradigm. Only when furnished with this information will our students be fully empowered to not only work with Speculative Design, but to make Speculative Design work for them in the world.

We should also— wherever it is possible—aspire to teach Speculative Design *outside of* Architecture and Design departments. As we have argued, Speculative Design should be considered a general tool with as broad appeal as statistics or psychology, and we should share it in the same way. It will be the case that for those without Design training and experience it may be harder to go through the creative/analytic processes which underpin the creation of Speculative Designs. But this is no different from it being difficult for those with solely Arts training to go through the processes which underpin a statistical analysis of a dataset. In both cases, just because they are different does not mean that specialists in the ‘other’ area shouldn’t be at least *aware* of how the other method works. Broadly speaking this call is simply to promote Speculative Design in curricula where it has not traditionally been seen, however, the *reason* for this promotion is particularly important. If we are considering the prospect of Speculative Design melting into the background of the mainstream, then part of that is awareness of what it is and how it works. Teaching Speculative Design—including the part about how it, at this point in the 21<sup>st</sup> century, is somewhat incompatible with the dominant knowledge paradigm—to law students, medical students, political scientists and ethicists, is what will lay the foundations for that knowledge paradigm to shift over time.

The last 50 years have seen much development in Design Research and in the last 30 years, Speculative Design has become a prominent part of that field. In section 2 we described a model of how Speculative Design, Research through Design and Design Research relate to one another. There are undoubtedly contrasting opinions on these matters, which would likely result in different models (we acknowledge the stance we adopt is very broad and inclusive). The result of this situation (which is proactively being addressed by initiatives such as *Speculative.Edu*<sup>12</sup> and *Design Research Works*<sup>13</sup>) is an inherent ambiguity across the Speculative Design landscape. This ambiguity makes it extremely difficult to infer concrete outcomes based on conversations about the role Speculative Design might play in any given context. Common attributes of this ambiguity manifest as in Speculative Design’s inherent interdisciplinarity, the contention within the Speculative Design community when considering contrasting ideologies and approaches, and the lack of an archetypal Speculative Designer—the boundaries of the field are permeable and its community is diverse and often transient [24]. As discussed in section 3 there have been calls for some time to ‘legitimize’ Speculative Design and Research through Design through the development of more formalized methods. It is our thesis that such calls are the product of a culture influenced by Scientism and, because of the nature of Speculative Design it is unlikely that it could be constrained without significantly impacting its utility. Such debates are hallmarks of what is termed a “pre-paradigmatic” discipline; a place where too much effort goes into describing and defending the approach, and not enough effort goes into actually applying the approach and doing the work [23]. It seems unlikely that the Speculative Design landscape will easily homogenize, and in fact, we can consider the breadth of approaches a strength. The only issue with this is, if our goal is to disappear into the background, its numerous fracture lines make the overall movement somewhat conspicuous and inaccessible. On this issue, we suggest a pragmatic approach such as

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<sup>12</sup> <https://speculativeedu.eu/>

<sup>13</sup> <https://designresearch.works/>

the one we adopted in section 2. When teaching Speculative Design, we should present a coherent model to our students which accepts its own limitations. In the context of a given course or programme it may be beneficial to focus on the Critical Theory aspect of Critical Design [39], the Science Fiction influences on Design Fiction [13], the performative potential of Speculative Enactments [17], or to tie Speculative Design back to the history of science [23]. The key, however, is to make it clear that each of these approaches exists within a broader order or taxonomy and that those approaches share attributes even if they are distinct from each other in stylistic and evolutionary terms. Acknowledging the ambiguity within the Speculative Design landscape but providing students with an accessible model allowing them to navigate it with ease, is the best mechanism to promote Speculative Design more broadly, without stifling it by artificially constraining its richness.

It seems likely that in support of the long-term aspiration of making Speculative Design disappear, ironically, a short-term goal should be to do everything possible to *increase* its visibility. If practitioners and teachers of Speculative Design proactively pursue collaborations and partnerships with those outside of the community itself and encourage students to do the same, this will act as an additional lever that, in the fullness of time, will help to normalise the ‘way of knowing’ that Speculative Design represents. A crucial strategic element in this endeavour is to acknowledge and celebrate, from the outset, that Speculative Design will offer a unique quality of insight (see section 3) that is likely in contrast to what collaborators are used to. Speculative Designers working in this way should be bold and clear about what to (and what *not* to expect from their approach, whilst also being humble and magnanimous about Speculative Design’s role in the project or challenge.

Finally, and as an overarching point of action, we feel that continued, clear and concise debate around these issues is crucial. This paper presents one perspective, which—we hope—will be critiqued and discussed by the Speculative Design community (with the aspiration that those discussions will ultimately refine, strengthen, and improve the argument). The rationale that we think those discussions should take place around is that Speculative Design is coming of age and in that process, it has the potential to move from the fringes into the kernel of 21<sup>st</sup> century knowledge production, and if that happens it is likely to happen as part of a larger shift in our global knowledge landscape. We should also, however, consider some limitations and elements of risk that the argumentation in the paper is not divorced from. In the interests of brevity, we list these risks and limitations concisely and as notes for further discussion and comment.

Applied incautiously Speculative Design can become an excuse for not doing expensive and time-consuming research. Hence, Speculative Design should not become a substitute for user research, ethnographic studies, focus groups, or any other approach to inquiry, but it should—where appropriate—*augment* these approaches; Speculative Designers should be mindful to ensure it is used ‘properly’. A related note of caution is that the aspects of the Speculative Design landscape that we have discussed in the paper, and the other topics, are treated sensitively and holistically. We have tried to articulate a position that pulls together several rhetorical threads to highlight the paper’s core contribution, and whilst it is enticing to consider individual elements of the argument in isolation, doing so would likely undermine the argument and serve to distort rather than clarify. Therefore, when considering the individual elements of our



argument, mitigating this risk should be considered carefully. The precise coordinates of the ‘post-truth era’ are blurry and hard to concisely describe, but it is undeniable that in some cases shared standards and assumptions about what constitutes *truth* have become diluted. In the context of such a political and philosophical turmoil, the idea of promoting *more speculation*, and doing so as part of Research and Education programmes, should not be without scrutiny. When mainstream media outlets cannot agree on what is true, should the research community advocate for non-objective inquiry? This is a thorny issue that is beyond the scope of this discussion, but it is certainly one to which Speculative Designers should pay attention. A potential avenue for future inquiry is to draw upon media theories (e.g. Mediatization [10]), to explore the relationships between designed artefacts and the political. Doing so could reveal productive avenues for integrating Speculative Design into mainstream discourse and mainstream praxes. A final word of caution, and a threat to the thesis we have presented, is the turbulent funding landscape. During times of austerity, the Arts and Humanities have tended to have their funding sources cut<sup>14</sup> and with the additional financial impacts of the Covid-19 pandemic, it seems plausible that the Arts (which Speculative Design, for the time being at least, is bound) may see similar cuts again. Whilst we cannot be certain as the mechanisms which have historically brought this to bear are complicated, there is a real risk that the momentum that Speculative Design has built up could be eroded by such cuts. This, as much as any of the other obstacles to broader adoption of Speculative Design, provides reason to clarify the broader context within which Speculative Design can, could, and perhaps *should* operate.

To conclude, we return to consider The Enlightenment, a time when ideas, thoughts, and cataclysmic shifts in understanding took place. The ripples of these shifts still affect us today. But now, in the 21<sup>st</sup> century, we live among new sources of agitation—Climate change, rapid Geopolitical shifts, Post Truth, Artificial Intelligence, The Internet of Things, *the Internet*—and these require new modes of response. We are being forced to live differently and to live differently is to *think* differently; “As the architects of the Enlightenment understood, this means being able to see the world and ourselves from a new perspective” [47]. Such perspectives, in our view, may be partially realised by careful and appropriate use of Speculative Design. Hence, we should promote and champion Speculative Design and support its success. As we have explained in this paper, perhaps the *ultimate* measure of this success should be to become part of the mainstream, to blend into the background, and to disappear completely.

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<sup>14</sup> There is a useful account of this phenomenon in this Guardian piece: <https://www.theguardian.com/education/2015/mar/29/war-against-humanities-at-britains-universities>

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## References

1. Donald Albrecht. 2012. *Norman Bel Geddes Designs America: I have Seen the Future*. Abrams.
2. James Auger. 2013. Speculative design: crafting the speculation. *Digital Creativity* 24, 1: 11–35. <https://doi.org/10.1080/14626268.2013.767276>
3. Russel Bertrand and Philippe-Roger Mantoux. 1971. *Science et Religion*. Gallimard.
4. T Binder and Johan Redström. 2006. Exemplary Design Research. In *Design Research Society Conference*.
5. Alan Blackwell, Lee Wilson, Charles Boulton, and John Knell. 2010. *Creating value across boundaries*. Retrieved from [http://www.nesta.org.uk/library/documents/creating\\_value\\_across\\_boundaries\\_may10.pdf](http://www.nesta.org.uk/library/documents/creating_value_across_boundaries_may10.pdf)
6. Julian Bleecker. 2009. Design Fiction: A short essay on design, science, fact and fiction. *Near Future Laboratory*. Retrieved February 2, 2014 from <http://blog.nearfuturelaboratory.com/2009/03/17/design-fiction-a-short-essay-on-design-science-fact-and-fiction/>
7. Ian Bogost. 2012. *Alien phenomenology, or, what it's like to be a thing*. U of Minnesota Press.
8. James Bridle. 2018. *New Dark Age: Technology and the End of the Future*. Verso.
9. John Constable. 1836. *Lecture Notes*.
10. Nick Couldry and Andreas Hepp. 2013. Conceptualizing Mediatization: Contexts, Traditions, Arguments. *Communication Theory* 23, 3: 191–202. <https://doi.org/10.1111/comt.12019>
11. P. Coulton and J.G. Lindley. 2019. More-Than Human Centred Design: Considering Other Things. *Design Journal* 22, 4. <https://doi.org/10.1080/14606925.2019.1614320>
12. Paul Coulton and Joseph Lindley. 2017. Vapourworlds and Design Fiction: The Role of Intentionality. *The Design Journal* 20. <https://doi.org/10.1080/14606925.2017.1352960>
13. Paul Coulton, Joseph Lindley, Miriam Sturdee, and Michael Mike Stead. 2017. Design Fiction as World Building. In *Proceedings of the 3rd Biennial Research Through Design Conference*, 1–16. <https://doi.org/10.6084/m9.figshare.4746964>
14. Nigel Cross. 2011. *Design Thinking: Understanding How Designers Think And Work*. Bloomsbury.

15. Anthony Dunne. 2006. *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*. The MIT Press.
16. Anthony Dunne and Fiona Raby. 2013. *Speculative Everything*. The MIT Press, London.
17. Chris Elsdon, Abigail Durrant, David Chatting, David Green, David Kirk, and D Abacus. 2017. Abacus Datagraphy : A Speculative Enactment. *Proceedings of the 3rd Biennial Research Through Design Conference*: 148–162. <https://doi.org/10.6084/m9.figshare.4746961>.Image
18. Jonathan St. B. T. Evans, Stephen E. Newstead, and Ruth M. J. Byrne. 2019. *Human Reasoning: The psychology of deduction*. Psychology Press. <https://doi.org/10.4324/9781315785028>
19. Laura Forlano. 2017. Posthumanism and Design. *She Ji* 3, 1: 16–29. <https://doi.org/10.1016/j.sheji.2017.08.001>
20. Christopher Frayling. 1993. Research in Art and Design. *Royal College of Art Research Papers* 1, 1: 1–9.
21. Christopher N. Gamble, Joshua S. Hanan, and Thomas Nail. 2019. What Is New Materialism? *Angelaki - Journal of the Theoretical Humanities* 24, 6: 111–134.
22. Bill Gaver and John Bowers. 2012. Annotated Portfolios. *Interactions* 19, 4: 40–49.
23. William Gaver. 2012. What should we expect from research through design? In *Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems - CHI '12*, 937–946.
24. David Philip Green and Joseph Lindley. 2021. Design Research and Ambiguity. In *14th International Conference of the European Academy of Design*, 291–297. Retrieved from <https://www.proceedings.blucher.com.br/article-list/ead2021-364/list#articles>
25. Julian Hanna. 2019. An Overview of Contemporary Speculative Practice. *SpeculativeEdu*. Retrieved from <https://speculativeedu.eu/an-overview-of-contemporary-speculative-practice/>
26. Sabrina Hauser, Doenja Oogjes, Ron Wakkary, and Peter Paul Verbeek. 2018. An annotated portfolio on doing postphenomenology through research products. In *DIS 2018 - Proceedings of the 2018 Designing Interactive Systems Conference*, 459–472. <https://doi.org/10.1145/3196709.3196745>
27. D. Kirby. 2010. The Future is Now: Diegetic Prototypes and the Role of Popular Films in Generating Real-world Technological Development. *Social Studies of Science* 40, 41–70.
28. Ilpo Koskinen, John Zimmerman, Thomas Binder, Johan Redström, and Stephan Wensveen. 2011. *Design Research Through Practice: From the Lab, Field, and Showroom*. Elsevier.
29. Jaron Lanier. 2013. *Who owns the future*. Simon and Schuster.
30. John Law. 2003. Making a mess with method. *Published online*. Retrieved from <http://www.lancs.ac.uk/sociology/research/publications/papers/law-making-a-mess-with-method.pdf>
31. John Law. 2004. *After Method: Mess in Social Science Research*. Routledge, London & New York.
32. J. Lindley, H.A. Akmal, and P. Coulton. 2020. Design Research and Object-

- Oriented Ontology. *Open Philosophy* 3, 1. <https://doi.org/10.1515/opphil-2020-0002>
33. Joseph Lindley. 2015. A pragmatics framework for design fiction. In *Proceedings of the 12th European Academy of Design Conference*.
  34. Joseph Lindley. 2018. A thesis about design fiction. Lancaster University. <https://doi.org/10.17635/lancaster/thesis/449>
  35. Joseph Lindley, Paul Coulton, and Haider Akmal. 2018. Turning Philosophy with a Speculative Lathe: Object Oriented Ontology, Carpentry, and Design Fiction. In *Proceedings of the Design Research Society Conference 2018*. <https://doi.org/10.21606/dma.2018.327>
  36. Joseph Lindley, Paul Coulton, and Miriam Sturdee. 2017. Implications for Adoption. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, 265–277. <https://doi.org/10.1145/3025453.3025742>
  37. William Odom, Ron Wakkary, Youn-kyung Lim, Audrey Desjardins, Bart Hengeveld, and Richard Banks. 2016. From Research Prototype to Research Product. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems - CHI '16*: 2549–2561.
  38. James Pierce. 2021. In Tension with Progression: Grasping the Frictional Tendencies of Speculative, Critical, and other Alternative Designs. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, 1–19. <https://doi.org/10.1145/3411764.3445406>
  39. James Pierce, Phoebe Sengers, Tad Hirsch, Tom Jenkins, William Gaver, and Carl DiSalvo. 2015. Expanding and Refining Design and Criticality in HCI. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems - CHI '15*: 2083–2092. Retrieved from <http://dl.acm.org/citation.cfm?id=2702123.2702438>
  40. Fiona Raby and Anthony Dunne. 2009. A/B. Retrieved October 27, 2014 from <http://www.dunneandraby.co.uk/content/projects/476/0>
  41. Rodriguez Ramirez. 2009. An epistemology for research through design. In *Proceedings of the ICSID Design Education Conference*, 1–14.
  42. Colin Robson. 2011. *Real World Research (3rd Edition)*. Wiley.
  43. Paul A. Rodgers and Joyce S.R. Yee. 2016. Design Research is Alive and Kicking. In *Design Research Society Conference*.
  44. Robbert Rosenberger and Peter P.C.C. Verbeek. 2015. A field guide to postphenomenology. In *Postphenomenological Investigations: Essays on Human-Technology Relations*. Lexington Books, 9–41.
  45. Bruce Sterling. 2014. *The Epic Struggle of the Internet of Things*. Strelka Press.
  46. Erik Stolterman. 2008. The Nature of Design Practice and Implications for Interaction Design Research. *International Journal of Design; Vol 2, No 1 (2008)* 2, 1: 55–65.
  47. Matthew Taylor. 2010. *Twenty-first century enlightenment*.
  48. Alvin Toffler and Heidi Toffler. 1970. *Future Shock*. Random House.
  49. Tonkinwise. 2015. Just Design: Being Dogmatic about Defining Speculative Critical Design Future Fiction. *medium.com*. Retrieved November 14, 2017 from <https://medium.com/@camerontw/just-design-b1f97cb3996f>
  50. Sherry Turkle. 2012. *Alone Together: Why we expect more from technology*

*and less from each other.* Basic Books.

51. Ron Wakkary. 2021. *Things we could design: For more than human-centered worlds.* MIT Press.
52. Eric Weil. 1965. Science in Modern Culture Or the Meaning of Meaninglessness. *Daedalus* 94, 1: 171–189.
53. Edward O. Wilson. 1998. *Consilience: The Unity of Knowledge.* Random House.
54. Ludwig Wittgenstein. 1969. *On Certainty.* Basil Blackwell.
55. John Zimmerman, Jodi Forlizzi, and Shelley Evenson. 2007. Research through design as a method for interaction design research in HCI. *Proceedings of the SIGCHI conference on Human factors in computing systems - CHI '07*: 493. <https://doi.org/10.1145/1240624.1240704>
56. John Zimmerman, Erik Stolterman, and Jodi Forlizzi. 2010. An Analysis and Critique of Research through Design : towards a formalization of a research approach. In *Proceedings of DIS 2010.*