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Chapter 12
Design and Other Ways of Knowing the Future

Ramia Mazé

The "future"—as a rhetorical device and as an orientation in practice—pervades contemporary design. The temporality implied by this rhetoric may contradict other prevalent conceptions of design, for example as a discipline preoccupied with form, materials, and space. Nevertheless, rhetorics of the future are ubiquitous in communications of promotional bodies, such as the (UK's Design Council, and professional associations, such as the World Design Organization and International Council of Design, as well as in the names of educational programs, professorships, and research projects. In these, "the future" is typically intended to evoke imaginaries of (and markets for) "transformation," "innovation," and "the new." Indeed, as Nina Wakeford (2014) has noted, design is just one of many disciplines affected by the increasing hegemony of particular political-economic narratives of innovation, progress, and the lure of the new. Noticeably missing from such narratives are related temporal phenomena such as "chance," "indeterminacy," and the "untimely" (Grosz, 1999). Selectivity in such framings already indicates that particular preferences, assumptions, and even ideologies are at stake.

Beyond the rhetoric, scholarship in design must further interrogate such narratives and concepts. This is critical to the development of design as a discipline, which entails development of the knowledge (or knowledges) core to design as well as the limits (or next frontiers) of the discipline. The prevalence of the "future" in articulations of design begs a question: What does it means for the discipline if the "future" is indeed within its scholarly and practical remit? This is a timely query within design and beyond. The knowledge foundations, core curricula, and competencies within design, formulated and academized as a discipline only recently, are still relatively nascent. Due to design's practical basis, it has emerged and developed differently within specific cultural, institutional, and political contexts. Unlike

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architecture, which has a longer and more established history in academia to ground both the intellectual discipline and the practical formation of professionals, design's knowledge foundations remain more heterogeneous and amorphous. Subject to "radically different interpretations," as Richard Buchanan (1992, p. 19) pointed out, "the flexibility of design often leads to popular misunderstanding and clouds efforts to understand its nature." In spite of this, design has gained attention well beyond itself.

Indeed, we are arguably experiencing a turn toward design by other disciplines. The social sciences, for instance, have debated design as a model for anthropology's future (Rabinow, Marcus, Faubion, & Rees, 2008), sociology has turned to more "inventive methods" (Lury & Wakeford, 2012), and "interdisciplines" such as "design anthropology" and "design ethnography" have emerged. Jeroen van den Hoven advocates for "The Design Turn in Applied Ethics", premised on a wide range of philosophers interested in the application and relevance of their thinking to societal problems. He argues: "They do not only attempt to offer applied ethical analysis, they also want to think about the economic conditions, institutional and legal mechanisms and incentive structures that need to be put in place in order to *realize* our moral views that result from our analysis. Design in the work of these authors is primarily focused on institutional design, but […] *The Design Turn* also pertains to technology, artefacts to the design of socio-technical systems" (van den Hoven, 2017, p. 23–24, emphasis in original). Indeed, given neo-liberalizing forces and socio-ecological challenges affecting the higher educational sector, universities themselves may be subject to a "Design Turn," argues Cameron Tonkinwise (2017, p. 36), the appeal being design's tendency toward synthesis, practical application, and societal impact. Design's capacity to bridge across and integrate diverse academic "cultures" has proved a powerful device for legitimizing its place within the university (Hellström Reimer & Mazé, 2023). In light of this so-called "design turn"—which entails considerable stakes beyond design itself—it is even more important to critically interrogate design's foundations and ways of knowing.

So, What Is Design? (or, What Isn't?)

Those inquiring into the nature of design and design knowledge frequently encounter definitions premised on this quotation: "everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (Simon, 1996, p. 130). This quote from Herbert Simon, especially when taken out of context, is expansive. Many actions—from the most trivial of daily acts to the most specialized technical activity—can be conceived as moving from one situation to a preferred one. In these terms, there is little beyond the limits or remit of design.

Although the idea of design in the quote seems expansive, Simon's (1988) proposed "science of design" is very specific in both historical and epistemological terms. Premised on a positivist epistemology and conceived as problem-solving, design according to Simon consists of rational, methodical activities in which

"problems" are narrow or "tame," amenable to calculated techniques to determine where a good course of action lies (Simon, 1996). Accordingly, his idea of design knowledge can be understood as primarily rational, cognitive, and dispassionate, a particular expertise claimed by particular kinds of designers. In the same historical context—post-war American reform of education and professional training—Donald Schön's (1983) pragmatist and experiential epistemology of design evolved in direct response and sharp contrast to Simon's (c.f. Dixon, 2019; Galle, 2011). Versions of these and alternative ideas of design have been developed since, each revealing a different conception of the knowledge, or knowledges, at stake within design and, beyond and by implication, in the wider "design turn."

The emerging field of "design futures" has produced yet another spin on the infamous quotation. In Simon's (1996) turn of phrase, the definition of design hinges on two states: "existing situations" and "preferred ones." This distinction has been much discussed, for example, scholars in the early "design methods movement" saw the two states as mirroring that of "problem" and "solution," in which design involved a particular process temporally divided up into two distinct phases (first the "problem definition", then the "problem solution"). This conception persists today (see the "Double Diamond,", Design Council, 2023), although a second generation of design methods scholars moved away from this in order to engage with more complex "wicked problems" (Buchanan, 1992). Some today have returned to a temporal interpretation of Simon's turn of phrase—not in terms of the design process itself, but in terms of the "existing" present as juxtaposed to "the future" that follows. Putting forward a "Simon-type observation," proponents of "design futures" Dan Hill and Stuart Candy (2019, p. 125) argue that "future-making" is something that many designers intuit and are now explicitly doing.

As these diverging interpretations of the quote reveal, design's core subject matter and knowledge foundations are varied. For some, the object of design knowledge and action is problem-solving, for some, it is the design process—and, for others, it is the future itself.

Which Knowledge(s), Whose?

I evoke Simon's quotation here for several purposes. Having motivated this paper in terms of the "design turn"—that is, by arguing that design matters beyond itself—I find this earlier, expansive, and influential conception to be an interesting precedent. Learning, however, from debates around that early formulation, I would like to argue for more elaborated, contextualized, and nuanced articulations of design and design knowledge(s). This matters for design, as each conception has different implications for what is deemed design's valid "objects" and, thus, what counts as design knowledge and competence (e.g., as a core of educational degrees and professional titles and recognized within associated institutions and economies). Some whose disciplines have turned toward design also call for more critical studies. Lucy Suchman, a prominent figure for "design anthropology," reminds us to attend to

design's limits, arguing that "design needs to acknowledge the specificities of its place, to locate itself as one (albeit multiple) figure and practice of transformation" (Suchman, 2011, p. 1).

I am seeking here neither a unified model nor a universal definition of design—rather, I am reflecting on the multiple and evolving design knowledge(s) at stake. In this paper, I begin by outlining a stereo(typical) understanding of design as object-centered, I then trace some emergent fields within design, elaborating elective glimpses of those particularly concerned with temporality and futurity. This reflects my interest in negotiation at the "agitated edges" of knowledge practices (Hellström Reimer & Mazé, 2023) and builds upon my earlier interdisciplinary inquiry into design in terms of time and futures (Mazé, 2007). I do this not as a historian but from my own experiences, having trained as an architect and designer and having worked as a practitioner and scholar involved with emergent fields of design and related transdisciplines within various (e.g., Northern European) contexts.

In addition to the question of *which* knowledge(s), I also reflect on *whose*. Another purpose of my evoking the Simon quotation is to point out the adjective "preferred." This implies that design involves not only knowledge but *preferences* about prospective solutions, processes, or futures, and that designers should be capable of distinguishing among alternatives and making judgments. For proponents of "design science," this might involve preferences concerning solutions to relatively tame and technical problems. In "design futures," however, and for those with an expansive conception of design as "future-making," there are quite profound implications in terms of which (or whose) future is preferred. In related (inter)disciplines such as Futures Studies, normative judgments are explicit, for example in the foundational model of the "futures cone" (Bell, 1997/2003) that differentiates among "probable", "possible," and "preferable" futures. However, and particularly given the normative and political dimensions of "design futures" (Mazé, 2016, 2019), further and critical study is necessary for developing and deepening the discipline of design and, given the wider "design turn," for disciplines and stakeholders beyond.

The Early "Object" of Design

Design is often perceived (stereo)typically as a matter of space, rather than time. Indeed, as philosopher Elizabeth Grosz articulates (1999), "space" has engendered many discourses and practices—architecture, urbanism, geography, and geology, for example—which might be understood, in part or even primarily, as occupied with the study, articulation, and regulation of space. A primary object of design is, literally, objects.

Historically, physical, material, and spatial objects have indeed been central to design. Particularly in Europe, the emergence of more professionalized roles (e.g., the "industrial designer" during the Industrial Revolution) centered on mass-produced objects such as furniture, appliances, and products. In the first half

of the twentieth century, design started becoming more formalized as a discipline, as academic programs began to emerge alongside (and to eventually replace) more informal ways of knowing and learning within apprentice and guild traditions. Those shaping academic curricula posited particular ideas about what was "core" to the discipline. A prime example centering spatial and material knowledge was the Bauhaus, a pioneering if short-lived school that thrived during the inter-war period in Weimar, Germany. It's "original curriculum" (1920–1930) (Itten, 1975) is portrayed through an iconic circular diagram, in which the core prominently revolves around materials such as stone, wood, metal, textiles, glass and clay. In the Bauhaus curriculum—a blueprint for many others then and since around the world—design was ontologically framed in terms of physical materials and epistemologically premised on hands-on sensory learning within a signature "studio pedagogy."

Designing spatial and material objects continues to be core to many curricula. This has persisted through the widespread transformation of design conceived of as "postindustrial" and postmodern. Even as new technologies and fields of design proliferated toward the end of the last century, design's early ontological and epistemological framing persisted. For example, Jeremy Myerson (1997, p. 178) at London's Royal College of Art argued: "[W]e know our students won't physically make things when they leave […] but their decisions will be based on the experience of making things." Still today, design's spatial and material roots are reflected in the nomenclature of fields such as:

- urban design,
- architectural design,
- interior design,
- exhibition design,
- industrial design,
- furniture design,
- graphic design,
- textile design, and
- jewelry design.

Example: **Acceptera***, an Object-Centered Manifesto of the Future*

Within the early decades of the twentieth century in Europe, however, some designers were explicitly concerned with time rather than space. This is evident in the manifestos (an important form of design discourse in the modern period) of several groups or movements. In fact, publication of the "Futurist" manifesto (Sant'Elia & Marinetti, 1914/1976) preceded that of the Bauhaus (Gropius, 1919/1971). *acceptera* (Åhrén et al., 1931/2008), the first manifesto of Swedish modern

design, is another relevant example with specific articulations regarding time and the future.

The authors of *acceptera*, a book-length manifesto featuring imagery alongside substantial text passages, drew strong contrasts between "A-Europe" and "B-Europe" (Åhrén et al., 1931/2008, p. 155–165). The latter is characterized by values, customs, peoples, and cultures portrayed as regressive and stuck in the past. A-Europe, instead, is held up as a model for the future, a standardized society, industrialized at all levels, from that of large-scale communications networks to local farming, leisure activities, and domestic work. *acceptera* is a manifesto for development in a predetermined direction, created on the basis of a modernist understanding of time, progress, and linear causality, a specific arrow of time, leading to a particular, and singular, societal future.

Designs suited to meeting this singular ("A") future vision populate the manifesto, including now iconic furniture, lighting, and interior designs, as well as architectural and urban programs for types of multi-dwelling high-rises that distinguish the Modern style. Underlying these designed objects and spaces are strong articulations of what living, families, communities, and societies should be in the future. For example, typical apartment layouts constrained family living in terms of size and roles (gendered, for example, in terms of the spaces for caretaking and domestic work) (Andersson, 2011). This was intentional "social engineering" by design, in which the middle-class nuclear family was the archetype for post-war mass housing (the "Million Program") for a rapidly growing and urbanizing society, which superceded a prior largely agrarian society, in which homes often accommodated multiple generations making shift with multi-functional objects (typical furniture included, for example, the "bed cupboard" and the "kitchen sofa" bed). In recent years, as Sweden has become more multicultural and diverse in many ways, modernist plans and interiors of the Million Program housing block apartments have been specifically critiqued as rigid and controlling and de/re-constructed in terms of more varied and open cultural, sexual, and gender norms (e.g., Stenberg, 2018).

The rhetorical device set up in *acceptera* exposes not only the concern for temporality and futurity, but also a strongly normative position of design: "B,", or "Sweden-then," contrasted against the preferred "A." This preference was not only that of the manifesto's authors: It was an explicit political position. *acceptera*'s politics were clear—the manifesto was distributed by the publishing branch of Sweden's Social Democratic political party.

Which Knowledge(s), Whose Preference(s)?

Multiple design knowledges are demonstrated in *acceptera*. The manifesto as an object in itself (a book) demonstrates what one might think of as (stereo)typical design knowledge. There is a purposeful and skilled use of imagery, typography, and layout for an eye-catching and iconoclastic message. Images and drawings depict existing and new products, spaces, and built environments, in which considerable

professional competence, technical skill, and aesthetic sensibility is evident in the industrial, interior, architectural, and urban design. However, and likely beyond the fundamentals taught in architecture and design schools at the time, the extensive and articulate text of the manifesto demonstrates skill and knowledge in argumentation and political rhetoric, in scientific and technological development, and in concepts and techniques of social as well as spatial planning. Indeed, as arguably one of the most powerful articulations of "functionalist" theory within architecture and design, its authors successfully integrated ideas about social engineering and social democracy, positioning design as the protagonist in a theory of socio-political change.

However, it is the methods and knowledge of other disciplines that reveal how socio-political change unfolded afterwards and over time. The profound and lasting effects of architecture and design on the construction of the Swedish welfare state are evident primarily in historical and philosophical studies (e.g., Mattsson & Wallenstein, 2010; Mattsson, 2023). Beyond the specific example of *acceptera*, architecture and design scholarship has increasingly incorporated historical and sociological perspectives to better understand the larger scale and longer-term effects of designs.

For example, the Foucauldian concept of "governmentality" has formed an important basis for socio-political analyses of design. In his classic account of governmental power (1978/1991), Foucault traceed a shift away from early forms of "hard" state power, exerted through military and territorial control, to more "soft" forms of modern power, in which urbanism, architecture, and design exert influence through "political ergonomics" (Winner, 1995), that is, visual, material, and spatial form that persuades, seduces, or coerces people and populations to behave in particular ways. Objects of critical study in this vein include traffic management systems (Silbey & Cavicci, 2005), graphic and product design of voting ballots and booths (Tunstall, 2007), architectural form and facades (Dovey, 2008), products and public spaces (Lockton, Harrison, & Stanton, 2010), border security infrastructure and services (Keshavarz, 2018), and designed programs for local governance (Mazé, 2021). Such concepts, adopted and integrated from other disciplines, reveal new dimensions of design, including the purposes and preferences of its commissioners and the socio-political effects on its users.

Beyond the Object in Postmodern Design

Temporality has entered into design more substantially and explicitly over the past half century. A book prefaced with an introduction that aptly captured the postmodern expansion of design—*Beyond the Object* (Thackara, 1988)—collated several emerging positions in design. Design in the "information age" involved not only giving form to sculptural objects in space, but also a "soft"-ware processes of computation and communication extending over time. As such processes infused spatial and societal relations, spatial knowledge alone seemed unable to account for social complexity, and some within design turned to concepts from other disciplines,

such as "chaos," "risk," "cybernetics," and "automata," as well as to cultural discourses of plurality and difference, protest and transgression, populism and consumerism. Such ideas influenced design in both direct and indirect ways, through new or hybrid ways of knowing and working in design practice as well as in the 'object' of design itself. For example, further fields have emerged within design (alongside the previously established and more spatially preoccupied ones), in which time, change, and futurity are explicit. These include:

- interaction design,
- communication design,
- experience design,
- service design,
- participatory design,
- transformation design,
- transition design,
- design futures, and more.

Temporality as Fundamental in Interaction Design

Fields such as "interaction design" emerged in terms that were barely spatial. Even its nomenclature implies time, as the term "interaction" has more traditionally been used in the physical sciences to characterize processes of reciprocal influence and, in the social sciences, to describe interpersonal communication. Interaction design emerged some decades ago at the intersection of multiple disciplines, including graphical and product design; computational, communication and cognitive sciences; human factors; and ergonomics.

The "objects" of interaction design include user interactions with computers (e.g., the design of software programs, interactive content, and digital services, as well as ways for people to interact with these through various devices) and "smart" products (for example devices, vehicles, buildings, and larger systems that behave dynamically over time). User access and interaction with and through these may happen in many ways including through tangible or graphical input mechanisms (such as touchpads, buttons, keyboards, mice, and joysticks) and automated sensing (of gesture, eye-tracking, movement, environmental or other inputs), often enabled by computational programs involving algorithms, machine learning, and AI. Interaction designs are by now ubiquitous and embedded into ordinary daily life, within our countless digitally enabled transactions, communications, experiences, and decisions within and across work and leisure, public and private sectors, from the most consequential (such as electronic ballots and voting systems) to the most intimate (such as healthcare services) of contexts.

The multiple disciplinary influences and temporal implications of interaction design expose the knowledges at stake within and beyond (stereo)typical design,

including an expanded range of knowledges concerning materials, computation, and use.

Materiality in interaction design must necessarily be considered in temporal terms. A Bauhaus-era lamp would be built out of materials such as glass and metal as well as electrical components for turning on and off mechanically. An interaction design may act as a lamp—for example, "flashlight" is a mobile phone app—but it is more fundamentally about the design of things that happen within or through a phone—for example, user interactions with app ads, movie content, or with remote control over their home security system. Even if, as Myerson argued, classic "making" and "studio" skills are still relevant for interaction designers, these kinds of design require more than traditional material epistemologies. "Smart" product and building design may involve intervention in material micro-structures (more traditionally in the knowledge domain of materials science) or macrostructure (potentially at the scale of architecture and civil engineering). Such design involves ways of conceptualizing and working with materials that "perform" in terms of a variety of structural, chemical, mechanical, and computational effects as well as the pace and orchestration of these effects during fabrication and, long after, in contexts of use. This is no longer selection from a stable and standing reserve of material resources that can be manipulated hands-on within the design studio; rather, these are designs that can span the spatial-temporal scales of "atoms and bits" through to "infobahns" with global reach (Mitchell, 1996).

The computation central to interaction design introduces further temporal dimensions. Indeed, computation is fundamentally temporal given that its basic elements—lines of code and commands—are executed sequentially and over time. The layered structure of computational devices entails that patterns and cycles of logical activity underway at various levels may intersect, reproduce, and evolve even over long periods of time. As these levels may be affected in various ways, the computer continues to be altered structurally—every time a program is run, a file written, or a new program added, the system undergoes a change that may cause it to act differently in the future. Interaction designers must also consider the temporality of use. As Suchman (1987, pp. 10–11) articulates, "real-time control over the computing process is placed in the hands of the user, through immediate processing and through the availability of interrupt facilities whereby the user can override and modify the operations in process." Thus, there are further temporal dynamics introduced through use in embodied, situated, and diverse contexts.

Temporality of future use thus entails further considerations. Like Bauhaus designers, interaction designers must make decisions at one point in time based on incomplete knowledge of potential users and future use. However, interaction designers must consider variables that will only ever be present in the future. Interactive apps, content, and services are to some extent dependent upon user activation, customization, preferences, and maintenance over time. For example, users discover many of the highly designed features of mobile phones only after a while, if at all, and necessary upgrades depend upon user action. An interaction design, rather than pre-given and fully present in space, only comes to be through and over time, at the will of the user. Anticipating use and users has thus become

central to interaction design—and extends design's remit in general even further into the space and time of future use. Whereas some fields in design remain more (stereo)typically object-centered, interaction design has become fundamentally "user-centered," involving theories and methods from the human and social sciences for anticipating, testing, and steering "usability", "pleasure," and even "emotional durability" (Chapman, 2015).

The temporality central to interaction design requires integration of knowledges from other disciplines. Such design includes consideration of various traditional and new materials, mechanical and computational technologies, and the interactions of individual users or collective interactions among and across devices and systems at nano-, micro-, macro-, trans-local, and global scales, a complex entanglement of material, computational, and social dynamics. Effects of reversability and predictability are mixed with those of synergy and emergence, those subject to "the arrow of time" and those not. Use and users are particularly unpredictable, entailing further spatial-temporal (in)determinability. To develop relevant knowledge foundations, scholars including myself and colleagues have attended particularly to interrogating and integrating ways of knowing and working within interaction design and relevant disciplines.

Which Knowledge(s), Whose Preference(s)?

Design theoretical foundations have necessarily expanded for interaction design, drawing in relevant knowledge from disciplines mentioned above and from further beyond. Particularly in relation to the temporality fundamental to interaction design, colleagues and I have theorized interaction design in terms of temporal as well as spatial "formgiving,", more specifically as "temporal form" (Mazé & Redström, 2005). With this concept, we are building upon philosophies of aesthetics and form. Johan Redström (2005/2010, p. 22) has articulated it in these terms: "[M]aterial is what builds the thing; form is the way material builds the thing" (c.f. Redström, 2001). Inspired by the philosopher Elizabeth Grosz (1999, 2001), I have explored how concepts of "becoming" and "futurity" can help us to articulate the complexity and indeterminability of how an interaction design changes and comes to be in part through users' own socio-political agency (Mazé, 2007). Colleagues have further developed related concepts in terms such as "becoming materials" (Bergström et al., 2010), "fluid assemblages" (Redström & Wiltse, 2019), and even "designing time," the motto of a new curriculum in Experience Design launched at Konstfack University of Arts, Crafts, and Design in 2007, for which I was one of the founding faculty welcoming students from music and dance, materials science and media, as well as from more traditional spatial design backgrounds.

Concepts such as "governmentality" have proven extensible and have been further developed for interaction design. Given the profound user-centeredness of interaction design, users (or user dependency, Mazé, 2007) can be seen as an "object" of interaction design (Redström, 2008). Indeed, social media and game

interaction design can induce addiction (Kaya, Türk, Batmaz, & Griffiths, 2023). Analyses of spatial and temporal form elements reveal such designs as "ordering devices" (Suchman, 1987, 2011), comprised of plans and scripts as well as "hooks" (Conway & Britton, 2023) and an embedded "computationalist order" (Golumbia, 2009). Some features may be imperceptible to users—for example, visual, sonic, and other cues inserted at speeds or sensory thresholds below that of human perception, which are explicitly designed to steer user decisions and behaviors (e.g., Ham, Midden, & Beute, 2009; Sohn, Nam, & Lee, 2009). Indeed, Paul Virilio (2006) articulated an emerging dimension of "governmentality" that operates through technologies of "speed." Through various such strategies as well as database logics, ISO-standards, and algorithms, design can be understood as a kind of "extrastatecraft" (Easterling, 2014). Within these designs are embedded the preferences of designers and of others—such as governments and corporations—that commission design.

Example: OSS Hope *to Colonize Mars*

A relevant example of the multiple temporalities at stake in contemporary design is one of the exhibits within Dubai's *Museum of the Future* (see Koch, 2024), which opened in 2022. Visitors entering the museum are metaphorically transported to the year 2071 and the *OSS Hope* space station on Mars. Practically, this involves visitors boarding a space capsule (in reality, an adapted freight elevator) to ascend into the museum. Creation of the experiential exhibit required multiple design fields and other disciplines including: highly specialized mechanical engineering (to simulate the feeling of acceleration and landing with a bump); scenography and lighting design (the walls, floor, and ceiling of the capsule mirror each other to give a sense of zero gravity); design of cinematic sound effects output through more than two dozen audio channels; and imagery and animations comprising more than a trillion pixels (so that each capsule "portal" reveals different scenes along the journey). Each element is orchestrated within a complex design that, ultimately, should manifest as a visitor experience of moving through vast amounts of space and time in 4 min. Visitors are immersed in a familiar "Space Age" narrative trope. In leaving behind a sick Earth and escaping to Mars, they are enrolled in a very particular set of assumptions and preferences regarding the future. Without exception, each visitor must actively choose from a selection of futuristic jobs and join the colonizing mission.

Design and Futurity

I have argued here that it is crucial to better understand what is meant by design, particularly given the "design turn" beyond design. In the previous two sections, I have used spatial and temporal dimensions of design as a means to articulate various fields within the design discipline in terms of different knowledge foundations. This is not to oppose space and time but to reveal the breadth, heterogeneity, and expansion of the discipline. On one hand, the "object" of design in terms of material and spatial form, which was core to many early design curricula including the influential Bauhaus model, remains a (stereo)typical imaginary of what design is, perpetuated in public perception through museum archives, exhibitions, magazines, and shops. But this has never been design's only remit. Even early exceptions are readily available, for example, *acceptera*, whose authors integrated social and spatial planning into design along with a particular political ideology about a preferred future.

More recently emerging fields expose how design has itself turned toward other disciplines, including other and manifold knowledges. Interaction designs—which are active, reactive, and interactive, crafted and programmed even at the scale of "atoms" and "bits"—require profound understanding of material, biological, chemical, and computational ideas. As people are central to how, and whether, digital content, experiences and services are used, designers have integrated some fundamentals from the human and social sciences, including ergonomic, cognitive. and behavioral sciences. Further, as social and political change have become aims of design—in part as political parties, governments, and corporations have turned to design in order to materialize and embed their preferences into enduring spatial and temporal forms—cultural, ethical, legal, and political dimensions are revealed. Temporality is one of many lenses through which we can inquire into the multiple and multiplying "objects" of design, its heterogeneous and expanding knowledge foundations.

Temporality in "experience design" and "service design" (fields that partly overlap with interaction design) typically involves the human-scale, real-time flow and duration of usage through space and time. To design for such use, knowledge including temporal conceptions may be drawn from psychology, phenomenology, and even "somaesthetics" (Höök, 2018). Service design may involve long-term use of public or commercial services, and a range of temporally oriented and practical conceptualizations have evolved, such as "customer journeys" and "life events." In these fields, knowledge from literature and the performing arts may be invoked through conceptions of design as time-based "storytelling," "orchestration," and "theater" involving technical, physical, symbolic, and experiential elements. Although not all interaction and service designs may explicitly aim to steer the future writ large, carefully designed usage inevitably unfolds in the future at a variety of spatial-temporal scales. Thus, I argue (Mazé, 2007), ideas about the future—"-futurity"—are at least implicit within such fields, and, for others such as "design futures," explicit.

As design thus turns towards other disciplines—and, as others turn toward design—further questions arise such how these knowledges relate. Do special so-called "designerly ways of knowing" (Cross, 2006) trump others or become eclipsed? Do they integrate, for example as expressed in formulations such as multi-, inter-, trans-, and cross-disciplinarity, and if so, how and on what terms?

This question is relevant to the rapidly growing field of "design futures." This moniker effectively puts forward a vast object for design—the future, or futures. Any number of further knowledges and preferences may be relevant to design with such a remit. Indeed, there are multiple approaches relevant to "design futures" with contrasting knowledge bases and preferences. On the one hand, designers have long created popular and persuasive visualizations of the future desired by corporations—think of the "concept cars" and "concept houses" displayed in world expos and trade shows to attract capital investment and instill popular desire for particular lifestyles. On the other hand, designers may critique companies' visions—those engaged in "critical design," for example, draw in part on critical social theory and science fiction to explore and prompt public debate about the (sub)cultural side effects and "dark sides" of emerging technologies. Although "concept design" and "critical design" objects may look similar on the surface, they have very different purposes, preferences, and politics (Mazé, 2020). These are just two of the contemporary genres through which designers engage (or others engage design to) influence future markets, public opinion, and cultural imaginaries (Dilnot, 2015).

As the field of "design futures" turns towards knowledges more typical in others, such as "futures studies," the terms of engagement are still an open question. Classic futures studies methods—such as "scenarios," "environmental scanning," "road-mapping," "futures wheel," and even the "Delphi method"—are being readily incorporated into design. Futures researchers and institutions (e.g., *Museum of the Future*) are increasingly making use of design and designers, for example to make high-level and abstract scenarios more appealing and accessible to wider audiences. This cross-fertilization may produce a new "interdiscipline," or each may subside back into themselves but augmented with new methods and techniques. There is, however, a distinct danger in a merely superficial encounter between disciplines. For example, some examples of "design futures" seem to uncritically reproduce techno-centric, colonial, and extractivist logics typical of some—but not all—epistemological paradigms present within futures studies. The danger of such a selective and superficial understanding of futures studies should be countered with more critical and profound engagement with the knowledge(s) at stake.

Futures Studies—Which Knowledge(s), Whose?

The discipline (or "transdiscipline") of futures studies is comprised of multiple approaches with different philosophical and historical roots—indeed, different foundations for futurity. Early approaches grew within post-war Western defense

Table 12.1 A typology of futures approaches

Key terms	Futures studies approaches	Underlying theories and/or paradigms	Goals
Probable futures	Predictive/ Empirical	Positivism, Empiricism	Analysis, Prediction
Preferred futures	Critical/ Postmodern	Critical Theory, Deconstruction	Normativity, Emancipation
Possible or alternative futures	Cultural/ Interpretive	Constructivism, Hermeneutics	Alternatives, "Other" Futures
Prospective or participatory futures	Prospective/ Participatory	Action Research, Hope Theories	Empowerment, Transformation
Planetary or integral futures	Integrative/ Holistic	Integral Theories, Planetisation Theories	Global Justice, Planetary Era

Note. Source: Adapted by author from Gidley et al. (2009, p. 429)

organizations and were further boosted by the need for long-term planning in the 1960s and 70 s. Such approaches are still mainstream, resonant in rhetoric and imagery of the "Atomic Era" and "Space Age." In these, the future is often portrayed as a singular, discrete, and definite location, to be reached according to theories of change following a billiard-ball sort of logic along linear pathways. In those pathways, the development of particular technologies is typically the privileged baseline for plotting human, cultural, and societal progress (that is, if social—much less ecological—factors are considered at all; see Wangel, 2011). Indeed, Ulrika Gunnarsson-Östling (2011) has argued that images and activities of women and Non-Westerners, as well as issues of particular relevance to these groups, remain noticeably absent in such futures studies. Adhering to the "middle class standard" of such futures can mean failing to recognize other (and sometimes more sustainable) practices, as well as disruptive innovations, which may be involved in everyday life, cultural traditions, and ecological niches. Thus, in light of such early approaches—and partly in opposition (Gidley, Fien, Smith, Thomsen, & Smith, 2009)—futures studies arose as an academic field in the mid-1960s.

A typology outlining multiple approaches within futures studies has been articulated by Jennifer Gidley et al. (2009; Gidley, 2017) (see Table 12.1). These types are not mutually exclusive, according to Gidley et al. (2009), but suitable for different contexts and purposes in practice—for my purposes here, the distinctions can be utilized to articulate different epistemological underpinnings. The differences between approaches to some degree reflect historical and geographic contexts as well as developments in other knowledge spheres. For example, and in contrast to the mainstream "predictive-empirical tradition" that can be traced from origins in post-war US defense intelligence, Gidley et al. (2009) point out a normative "critical-postmodern" approach within futures studies in Europe, its practitioners making explicit context and values dimensions, a "prospective-action" approach with French precedents, and an ongoing focus in Swedish and Australian futures studies on engaging participants to change awareness and prompt action.

Multiple Ways of Knowing the Future

Understanding futures studies as comprised of strands with different epistemological orientations provides a more variegated landscape for potential design engagement. With reference to Gidley et al.'s (2009) typology, designers have arguably engaged primarily with futures approaches underpinned by positivist logics and, to a lesser extent, by critical theory, action research, and cultural paradigms. To the first point, for example, designers have readily adopted and now commonly utilize "foresight" and associated techniques of "forecasting" in order to predict what is likely to happen in the future. Predictions may be manifested in roadmaps for design business development as well as for future product lines—for example as a basis for materializing futuristic cars and houses in "concept design." Foresight is often, and historically has been, associated with a positivist worldview, in which knowledge of the future should be built scientifically from empirical evidence of past and current phenomena (e.g., not "science fiction") following deterministic logic of cause and effect (Piirainen & Gonzalez, 2015). Design futures in terms of foresight, thus, is an approach that may contrast with others not only in goals and methods but in terms of epistemology. For example, those engaging with "critical"—also "norm-critical" (Andersson, 2023) and "counterfactual" (Light, 2021)—design futures may seek neither scientific evidence nor reliable roadmaps but, rather, employ critical theories to expose the assumptions, norms, and preferences embedded in ideas of progress or predicted trends.

Beyond early or mainstream futures approaches, design may align with "critical" and "participatory" varieties of futures studies. Much of design is arguably aligned not with positivism, but with pragmatism (Dixon, Rylander Eklund, & Wegener, 2023), science and technology studies (STS) (Woodhouse & Patton, 2004), and constructivism (c.f. Verbeek, 2005), which is clearly evident in participatory design and design anthropology. In these fields, the future may not be seen as a separate space and time but as always already "in the making" (Binder et al., 2011) and even "already here" within a continuous unfolding of the past and the present (Kjærsgaard et al., 2016). "The future," as a social construct, is seen as amenable to deconstruction, deliberation, and, furthermore, co- or collective design through action- and participatory action research methods of "rehearsing the future" (Halse, Brandt, Clark, & Binder, 2010) and "ethnographies of the possible" (Smith, Vangkilde, & Kjaersgaard, 2016). Proponents of "collaborative future-making" (Jönsson, Lindström, & Ståhl, 2021), influenced by STS, feminist technoscience, and new materialist concepts, focus not on the future per se but on "staying with the trouble" (Haraway, 2016) and "thickening the present" as relevant to anticipatory and design futures practices.

"Critical" and "cultural" varieties of futures studies may align with ecologizing and decolonizing movements in design, whose supporters understand design today as unsustainable to the point of being fatal (or "defuturing," Fry ,1999/2020) for many people, cultures, species, and for the planet. Toward a goal of more equality or equity for those others, and potentially aligned with "planetary" futures, such

movements may widen design to include the interests of other and underrepresented social groups, future generations, and more-than-humans. For example, Martín Ávila (2022) elaborates an "ecocentric" mode of design that takes into account "all life forms," Emilija Veselova (2023) theorizes participatory design processes that include natural entities, and Klaas Kuitenbrouwer (Zoöp, 2023) develops a "zoönomic" method and certification process to "safeguard the interest of all life" within legal and organizational models as well as in design and futuring processes. Beyond including or centering other bodies, beings and entities, some movements in design and futures move toward other epistemologies altogether. Decolonizing movements, for example, often stem from "epistemologies of the South" (Santos, 2002)—in design, see "kokoro" (Akama, 2017) and "sentipensar" (Escobar, 2018, 2020) (c.f. Calderón Salazar, 2021)—and other ways of knowing than the Western knowledge paradigms currently dominating design.

Although those working in design have tended to borrow selectively and superficially from futures studies, the identification of different typological approaches in futures studies suggests multiple potential types of "design futures." Further, it suggests the need for more profound interrogation of underpinning theories and knowledge paradigms (as in Table 12.1), that is, which knowledges and whose are at stake. Indeed, the continued domination of mainstream approaches in futures studies and of forecasting in design might also explain the relative absence (or resistance) of others. Bergman, Engwall, Gunnarsson-Östling, and Johannesson (2014) point at the suspicion some feminists harbor towards "the future," which may be a fear of falling into the trap of universalism, linear temporality, and narrow definitions of progress. Barbara Adam (e.g., Adam & Groves, 2007), for example, illuminates how futures studies framed in terms of the management of "time" and "futures" is explicitly modern, Western, and patriarchial. Futures scholars such as Sohail Inayatullah (1990) point out that time as structured in terms of three categories—past, present, and future, that is, a tripartite ontology—can be queried as historically- and culturally specific, given that concepts of "the future" scarcely exist in some cultures. Broadening and deepening our approaches of "design futures" thus also entails further engagement in these and other's critiques and ontologies relevant to "futurity," as well as their ethical-political standpoints.

Example: Stockholm 2030 Otherwise

A recent response to the City of Stockholm's *Vision 2030: A guide to the future* (City of Stockholm, 2007) brings to life a particular way of using future visions to both critique and to empower others in redirecting towards alternative futures. In their response, Bradley, Gunnarsson-Östling, Schalk and Andreasson (2017) analyze the official city vision through the theoretical lenses of feminist political ecology. They carefully articulate their critique in text and, further, put forward their alternative vision in the form of carefully composed illustrations and a city map, pointing out several specifically sited architectural and design proposals.

The content as well as imagery of their response stands in stark contrast to the city's. Text within the official *Vision 2030*, named "A World Class Stockholm," is full of assertions and exclamation marks (rhetorically not far from the proclamatory tone of *acceptera*). It is full of bright and colorful photos resembling tourist postcards, including photos of individual children, posed and smiling like models. It unfolds through several sections, the first seemingly aimed at prospective students and tourists, the second, themed "innovation and growth," targeting businesses and knowledge workers, and the third, citizen beneficiaries of public social services. Marked on its maps are sites such as: Kista Science City, the newly built neighborhood Hammarby Sjöstad, Stockholm Royal Seaport, and Klara Hotel and Conference Center. Bradley et al's (2017) counter-vision has a low-tech and collage aesthetic, as if local amateurs have captured glimpses of existing places and communities and cut and pasted them into a larger illustration, with a wide and diverse color palette (and skin tones). Here, there is no sleek "starkitecture" (icons built by celebrity architects) nor historical monuments—rather, there are neighborhood multi-functional spaces, concerts, and gardens. Children are depicted as interacting within a larger collective that is multigenerational and multispecies, in which their agency and voice as well as that of animals is reinforced through speech bubbles. Imaginary projects on their map include: Neighborhood Kitchens, Retrofitting Suburbia, Kungens Kurva Souk, and Supercycle Highways.

Bradley et al. (2017) carefully articulate their theoretical and epistemological underpinnings— that is, feminist political ecology research—through which they query access to and control over environmental resources. In such research, gender is in focus, including women's knowledge, gendered ways of handling ecological change, the value of local knowledge, women's socio-environmental struggles, power relations in decision-making about the environment, and critiques of technological progress and domination of nature (Rocheleau, Thomas-Slayter, & Wangari, 1996). Bradley et al.'s (2017) feminist stance concerns not only the roles of men and women, but also other divisions and hierarchies, such as nature-culture or the developed-developing world. In contrast to binaries and essentialist categories, they articulate a decentered subject and poststructuralist power analysis (Elmhirst, 2011) and an intersectional approach, with which they take into account gender, class, ethnicity, sexuality, place, and, more recently, "more-than-human" approaches (Bennett, 2010). Bradley et al. (2017, p. 304) articulate their proposition as:

> imagination of another world-order, beyond the economic growth paradigm, freed from the complex of patriarchy-capitalism-militarism-colonialism […] a system where the creation and quality of life is placed in the centre, where production is synchronized with needs of consumption (rather than focusing on profit and growth)—a society entailing decentralized and local economies and bureaucracies, and life characterised by equity between genders as well as between different societal groups, territories, species and generations.

Bradley et al.'s (2017) project is more more aligned with "critical" and "cultural" strands of futures studies, in which particular futures are critiqued and preferred futures put forth. Those adopting this kind of approach question and articulate assumptions and norms, and they put forward alternative standpoints and multiple (including underrepresented and marginalized) perspectives. They refute the idea

that critical theory is merely a negative activity of looking for flaws and absences, arguing that feminist critical positions can also be productive and inspiring. Furthermore, rather than restricting their response to proclamation and publication, they took forward their proposed vision into deliberative and collaborative forums with stakeholder groups. Such futures studies approaches aligning with feminist criticality can be seen, Bergman et al. (2014, p. 67) articulate, as "a way of making temporal knowledge production more tangible and engaging, as well as a way of intensifying the debate about the future in politics and planning."

Conclusion

I have here used temporality as a lens to interrogate and elucidate design in terms of some knowledge foundations and ways of knowing. Although design's early "object" was centered on material and spatial form, that has never been its only remit, as exemplified in *acceptera*. Practitioners of more recently emerging fields of interaction and experience design reveal time as central, that is, the temporality of (inter)active materials, digital/computational processes, and user interaction with and across devices and systems at scales well below and far beyond the threshold of human perception. Interaction design thus exposes the expanding knowledge foundations of design, including theories and practices informed by disciplines such as material, computational, cognitive, social, and political sciences. Further normative dimensions of design are also revealed, as interaction designs embody *preferences* about user experiences and social interactions. Communities, companies, civil society organizations, and governments increasingly turn to design in order to embed their preferences into spatial and temporal forms. Indeed, societal and political change are explicit aims in contemporary design for "behavior change," "social innovation," and "public policy" (Kimbell, Durose, Mazé, & Richardson, 2022), such that further knowledge domains relevant to design include ethics, law, and politics. Temporality is one of many ways through which to expose and explore the heterogeneous nature of design, to inquire about *which* knowledges as well as *whose* are at stake.

Futurity, as a particular way of framing temporal concern, is explicit in the nomenclature of nascent fields such as "design futures." Futurity has long been more or less implicit in design, as evident in various movements, from the early modern (e.g., *acceptera* and the *Futurists*) through to the contemporary (e.g., concept and critical design). Today, those engaged in "design futures" are putting forward a vast object for design—the future, or futures—and any number of further knowledges and preferences may be relevant to design with such a remit. But the stakes are high if we are to go beyond uncritical design (re)production of futures that are techno-centric, colonial, and extractivist (e.g., *OSS Hope* in the *Museum of the Future*). Delving further into futures studies—for example through Gidley et al.'s (2017) typology here—reveals a multiplicity of possible design orientations with different theoretical foundations and different practical goals. Beyond foresight and

positivist paradigms, "critical" and "participatory" futures studies resonate with design ways of knowing premised on pragmatist, STS, and constructivist paradigms, and "critical" and "cultural" futures studies may open joint prospects for ecologizing and decolonizing movements. New alignments may also be forged with those philosophically and politically engaged with futurity but critical of certain futures paradigms and proliferating buzzwords (e.g. Stockholm 2030).

Whereas various scholars and practitioners herald a "design turn" in their own disciplines and professions, I have here outlined ways in which designers have also turned towards others. Attending to the changing and heterogeneous nature of design is, I would argue, one way of contributing critically to its development as a discipline. Resisting a singular definition or grand narrative of design, which is inevitably reductive and risks universalizing, I argue instead for more situated accounts. By definition, such accounts do not exist in a vacuum. Rather, situatedness entails precedents, contingencies, and influences in, on, and of design. From this perspective, there are always and inevitably multiple and heterogeneous "designerly ways of knowing" (Cross, 2006). This means that as design turns towards futures and vice versa, there are multiple possibilities for meaningful engagement that need not be reduced to design merely (re)producing others visions. Attending with sensitivity to diverse forms of knowledge work "between and across" (Rendell, 2013) disciplines can reveal transitions within each, and even mutual transformation. Within and well beyond design, the turn of, and to, design raises a host of critical questions—and exciting possibilities.

References

Adam, B., & Groves, C. (2007). *Future matters: Action, knowledge, ethics.* Supplements to the Study of Time: Vol. 3. Leiden: Brill.

Åhrén, U., Asplund, G., Gahn, W., Markelius, S., Paulsson G., & Sundahl, E. (2008). acceptera. In L. Creagh, H. Kåberg, & B. Miller Lane (Eds.), *Modern Swedish design: Three founding texts* (pp. 140–347). New York: The Museum of Modern Art. (Original work published 1931)

Akama, Y. (2017). Kokoro of design: Embracing heterogeneity in design research. *Design and Culture, 9,* 79–85. https://doi.org/10.1080/17547075.2017.1280266

Andersson, C. (2011). Abnormal. In M. Ericson & R. Mazé (Eds.), *Design act*: *Socially and politically engaged design today—critical roles and emerging tactics* (pp. 230–231). London: Sternberg Press.

Andersson, C. (2023). *Materialising norms: Norm-critical and speculative explorations in design* (Doctoral dissertation). Aalto University, School of Arts, Design and Architecture, Helsinki, Finland.

Ávila, M. (2022). *Designing for interdependence*: *A poetics of relating.* London: Bloomsbury.

Bell, W. (2003). *Foundations of futures studies: History, purposes, and knowledge*. Human Science for a New Era: Vol. 1. Abingdon: Routledge. (Original work published 1997)

Bennett, J. (2010). *Vibrant matter: A political ecology of things*. Durham, NC: Duke University Press.

Bergman, H., Engwall, K., Gunnarsson-Östling, U., & Johannesson, L. (2014). What about the future? The troubled relationship between futures and feminism. *NORA—Nordic Journal of Feminist and Gender Research, 22,* 63–69. https://doi.org/10.1080/08038740.2013.854831

Bergström, J., Clark, B., Frigo, A., Mazé, R., Redström, J., & Vallgårda, A. (2010). Becoming materials: Material forms and forms of practice. *Digital Creativity, 21,* 155–172. https://doi.org/10.1080/14626268.2010.502235

Binder, T., De Michelis, G., Ehn, P., Jacucci, G., Linde, P., & Wagner, I. (2011). *Design things*. Cambridge, MA: MIT Press.

Bradley, K., Gunnarsson-Östling, U., Schalk, M., & Andreasson, J. (2017). Futurist feminist political ecology: Rewriting *Stockholm's Vision 2030*. In M. Schalk, T. Kristiansson, & R. Mazé (Eds.), *Feminist futures of spatial practice: Materialisms, activisms, dialogues, pedagogies, projections* (pp. 301–327). Baunach: Spurbuchverlag.

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues, 8*(2), 5–21. https://doi.org/10.2307/1511637

Calderón Salazar, P. (2021). *Walking the word of design: Explorations and reflections of a decolonial-interventionist practice* (Doctoral dissertation). KU Leuven, School of Arts, Leuven, Netherlands.

Chapman, J. (2015). *Emotionally durable design: Objects, experiences and empathy* (2nd ed.). London: Routledge.

City of Stockholm (2007). *Vision 2030: A guide to the future*. Retrieved June 6, 2023, from https://international.stockholm.se/globalassets/ovriga-bilder-och-filer/framtidsguiden_eng.pdf

Conway, S., & Britton, S. (2023). Let's argue! Designing satire in digital games. *Design Issues, 39*(2), 41–56. https://doi.org/10.1162/desi_a_00716

Cross, N. (2006). *Designerly ways of knowing*. London: Springer. https://doi.org/10.1007/1-84628-301-9

Design Council. (2023). The double diamond: A universally accepted depiction of the design process. Retrieved June 7, 2023, from https://www.designcouncil.org.uk/our-resources/the-double-diamond

Dilnot, C. (2015). History, design, futures: Contending with what we have done. In T. Fry, C. Dilnot, & S. Stewart (Eds.), *Design and the question of history* (pp. 131–243). London: Bloomsbury.

Dixon, B. (2019). Experiments in experience: Towards an alignment of research through design and John Dewey's pragmatism. *Design Issues, 35*(2)*,* 5–16. https://doi.org/10.1162/desi_a_00531

Dixon, B., Rylander Eklund, A., & Wegener, F. (Eds.). (2023). Introduction: Pragmatism, Dewey and design inquiry. *Design Issues, 39*(4), 3–8. https://doi.org/10.1162/desi_e_00733

Dovey, K. (2008). *Framing places: Mediating power in built form* (2nd ed.). Abingdon: Routledge.

Easterling, K. (2014). *Extrastatecraft: The power of infrastructure space*. London: Verso.

Elmhirst, R. (2011). Introducing new feminist political ecologies. *Geoforum, 42,* 129–132. https://doi.org/10.1016/j.geoforum.2011.01.006

Escobar, A. (2018). *Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds.* Durham, NC: Duke University Press.

Escobar, A. (2020). Sentipensar with the earth: Territorial struggles and the ontological dimension of the epistemologies of the South. In A. Escobar (Ed.), *Pluriversal politics: The real and the possible* (pp. 67–83). Latin America in Translation. Durham, UK: Duke University Press. https://doi.org/10.1515/9781478012108-008

Foucault, M. (1991). Governmentality. In G. Burchell, C. Gordon, & P. Miller (Eds.), *The Foucault effect: Studies on governmentality* (pp. 87–104). Chicago, IL: University of Chicago Press. (Original work published 1978)

Fry, T. (2020). *Defuturing: A new design philosophy*. London: Bloomsbury. (Original work published 1999)

Galle, P. (2011). Foundational and instrumental design theory. *Design Issues, 27*(4), 81–94. https://doi.org/10.1162/DESI_a_00107

Gidley, J. M. (2017). *The future: A very short introduction*. Oxford, UK: Oxford University Press.

Gidley, J. M., Fien, J., Smith, J.-A., Thomsen, D. C., & Smith, T. F. (2009). Participatory futures methods: Towards adaptability and resilience in climate-vulnerable communities. *Environmental Policy and Governance, 19,* 427–440. https://doi.org/10.1002/eet.524

Golumbia, D. (2009). *The cultural logic of computation*. Cambridge, MA: Harvard University Press.

Gropius, W. (1971). Programme of the Staatliches Bauhaus in Weimar. In U. Conrads (Ed.), *Programs and manifestoes on 20th-century architecture* (pp. 49–53). Cambridge, MA: MIT Press. (Original work published 1919)

Gunnarsson-Östling, U. (2011). Gender in futures: A study of gender and feminist papers published in Futures, 1969–2009. *Futures, 43,* 1029–1039. https://doi.org/10.1016/j.futures.2011.07.002

Grosz, E. (Ed.). (1999). *Becomings: Explorations in time, memory and futures*. Ithaca, NY: Cornell University Press.

Grosz, E. (2001). *Architecture from the outside: Essays on virtual and real space*. Cambridge, MA: MIT Press.

Halse, J., Brandt, E., Clark, B., & Binder, T. (Eds.). (2010). *Rehearsing the future*. Copenhagen, Denmark: The Danish Design School Press.

Ham, J., Midden, C., & Beute, F. (2009). Can ambient persuasive technology persuade unconsciously? Using subliminal feedback to influence energy consumption ratings of household appliances. *Proceedings of the 4th International Conference on Persuasive Technology,* Article No. 29, 1–6. https://doi.org/10.1145/1541948.1541988

Haraway, D. J. (2016). *Staying with the trouble*: *Making kin in the Chthulucene*. Durham, NC: Duke University Press.

Hellström Reimer, M., & Mazé, R. (2023). Stories from third space: A case and considerations of design research education from a Swedish vantage point. *Arts and Humanities in Higher Education, 23,* 1–23. https://doi.org/10.1177/14740222231200183

Hill, D., & Candy, S. (2019). Change the model. *Journal of Futures Studies, 23*(4)*,* 123–128. https://doi.org/10.6531/JFS.201906_23(4).0013

Höök, K. (2018). *Designing with the body: Somaesthetic interaction design*. Cambridge, MA: MIT Press.

Inayatullah, S. (1990). Deconstructing and reconstructing the future: Predictive, cultural and critical epistemologies. *Futures, 22,* 115–141. https://doi.org/10.1016/0016-3287(90)90077-U

Itten, J. (1975). *Design and form: The basic course at the Bauhaus and later* (revised ed.). London: John Wiley & Sons.

Jönsson, L., Lindström, K., & Ståhl, Å. (2021). The thickening of futures. *Futures, 134,* 102850. https://doi.org/10.1016/j.futures.2021.102850

Kaya, A., Türk, N., Batmaz, H., & Griffiths, M. D. (2023). Online gaming addiction and basic psychological needs among adolescents: The mediating roles of meaning in life and responsibility. *International Journal of Mental Health Addiction*. https://doi.org/10.1007/s11469-022-00994-9

Keshavarz, M. (2018). *The design politics of the passport: Materiality, immobility, and dissent*. London: Bloomsbury.

Kimbell, L., Durose, C., Mazé, R., & Richardson, L. (2022). Design for public policy: Embracing uncertainty and hybridity in mapping future research. In D. Lockton, S. Lenzi, P. Hekkert, A. Oak, J. Sádaba, & P. Lloyd (Eds.), *DRS2022*: 25 June - 3 July, Bilbao, Spain. https://doi.org/10.21606/drs.2022.303

Kjærsgaard, M. G., Halse, J., Smith, R. C., Vangkilde, K. T., Binder, T., & Otto, T. (2016). Introduction: Design anthropological futures. In R. C. Smith, K. T. Vangkilde, M. G. Kjaersgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design anthropological futures* (pp. 1–16). London: Bloomsbury. https://doi.org/10.4324/9781003085188

Koch, N. (2024). Scientific nationalism and museums of the future in Germany and the UAE. *Political Geography, 113*, 103144. https://doi.org/10.1016/j.polgeo.2024.103144

Light, A. (2021). Collaborative speculation: Anticipation, inclusion and designing counterfactual futures for appropriation. *Futures, 134,* 102855. https://doi.org/10.1016/j.futures.2021.102855

Lockton, D., Harrison, D. J., & Stanton, N. A. (2010). *Design with intent: 101 patterns for influencing behaviour through design*. Windsor: Equifine.

Lury, C., & Wakeford, N. (Eds.). (2012). *Inventive methods: The happening of the social*. Abingdon: Routledge.

Mattsson, H. (2023). *Architecture & retrenchment: Neoliberalization of the Swedish model across aesthetics and space, 1968–1994*. London: Bloomsbury. https://doi.org/10.1080/13574809.2024.2328471

Mattsson, H., & Wallenstein, S.-O. (2010). *Swedish modernism: Architecture, consumption and the welfare state*. London: Black Dog.

Mazé, R. (2007). *Occupying time: Design, technology, and the form of interaction* (Doctoral dissertation). Malmö University, School of Arts and Communication, Malmö, Sweden. Stockholm: Axl Books.

Mazé, R. (2016). Design and the future: Temporal politics of "making a difference". In R. C. Smith, K. T. Vangkilde, M. G. Kjaersgaard, T. Otto, J. Halse, & T. Binder (Eds.), *Design anthropological futures* (pp. 37–54). London: Bloomsbury.

Mazé, R. (2019). Politics of designing visions of the future. *Journal of Futures Studies, 23*(3), 23–38. https://doi.org/10.6531/JFS.201903_23(3).0003

Mazé, R. (2020). Critical form(ations): Forms of critical practice in design. In S. Foraita, B. Herlo, & A. Vogelsang (Eds.), *Matters of communication: Formen und Materialitäten gestalteter Kommunikation* [] (pp. 46–54). Bielfeld: transcript.

Mazé, R. (2021). Design (govern)mentalities: Implications of design and/as governance in Cape Town. In M. Rezai & M. Erlhoff (Eds.), *Design and democracy: Activist thoughts and examples for political empowerment* (pp. 13–27). Basel: Birkhäuser. https://doi.org/10.1515/9783035622836-004

Mazé, R., & Redström, J. (2005). Form and the computational object. *Digital Creativity, 16,* 7–18. https://doi.org/10.1080/14626260500147736

Mitchell, W. J. (1996). *City of bits: Space, place and the infobahn*. Cambridge, MA: MIT Press.

Myerson, J. (1997). Tornadoes, t-squares and technology: Can computing be a craft? In P. Dormer (Ed.), *The culture of craft: Status and future* (pp. 176–185). Manchester, UK: Manchester University Press.

Piirainen, K. A., & Gonzalez, R. A. (2015). Theory of and within foresight: "What does a theory of foresight even mean?" *Technological Forecasting and Social Change, 96,* 191–201. https://doi.org/10.1016/j.techfore.2015.03.003

Rabinow, P., Marcus, G. E., Faubion, J. D., & Rees, T. (2008). *Designs for an anthropology of the contemporary*. Durham, NC: Duke University Press. https://doi.org/10.1515/9780822390060

Redström, J. (2001). *Designing everyday computational things* (Doctoral dissertation). Gothenburg University, Department of Informatics, Gothenburg, Sweden.

Redström, J. (2008). RE:Definitions of use. *Design Studies, 29,* 410–423. https://doi.org/10.1016/j.destud.2008.05.001

Redström, J. (2010). On technology as material in design. In M. Redström, J. Redström, & R. Mazé (Eds.), *IT+Textiles* (2nd ed., pp. 12–29). Borås, Sweden: The Interactive Institute, The Swedish School of Textiles, University of Borås. (Original work published 2005)

Redström, J., & Wiltse, H. (2019). *Changing things: The future of objects in a digital world*. London: Bloomsbury.

Rendell, J (2013). Working between and across: Some psychic dimensions of architecture's inter- and transdisciplinarity. *Architecture and Culture, 1,* 128–140. https://doi.org/10.2752/175145213X13756908698685

Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (Eds.). (1996). *Feminist political ecology*: *Global issues and local experiences.* London: Routledge.

Sant'Elia, A., & Marinetti, F. T. (1976). Futurist architecture. In U. Conrads (Ed.), *Programs and manifestoes on 20th century architecture* (pp. 34–38). Cambridge, MA: MIT Press. (Original work published 1914)

Santos, B. D. S. (2002). *Towards a new legal common sense: Law, globalization, and emancipation.* London: Butterworths.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
Silbey, S., & Cavicci, A. (2005). The common place of law. In B. Latour & P. Weibel (Eds.), *Making things public: Atmospheres of democracy* (pp. 556–565). Cambridge, MA: MIT Press.
Simon, H. A. (1988). The science of design: Creating the artificial. *Design Issues, 4*(1/2)*,* 67–82.
Simon, H. A. (1996). *The sciences of the artificial* (3rd ed.). Cambridge, MA: MIT Press.
Smith, R. C., Vangkilde, K. T., Kjaersgaard, M. G., Otto, T., Halse, J., & Binder, T. (Eds). (2016). *Design anthropological futures*. London: Bloomsbury.
Sohn, M., Nam, T., & Lee, W. (2009). Designing with unconscious human behaviors for eco-friendly interaction. *CHI '09 Extended Abstracts on Human Factors in Computing Systems,* 2651–2654. https://doi.org/10.1145/1520340.1520375
Stenberg, E. (2018). Million program kitchens: Reconstructing the welfare state. In S. Gromark, J. Mack, & R. van Toorn (Eds.), *Rethinking the social in architecture: Making effects* (pp. 240–247). Architecture in Effect: Vol. 1. Barcelona: ACTAR.
Suchman, L. A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge, UK: Cambridge University Press.
Suchman, L. A. (2011). Anthropological relocations and the limits of design. *Annual Review of Anthropology, 40*(1)*,* 1–18. https://doi.org/10.1146/annurev.anthro.041608.105640
Thackara, J. (1988). Beyond the object in design. In J. Thackara (Ed.), *Design after modernism: Beyond the object* (pp. 11–34). London: Thames and Hudson.
Tonkinwise, C. (2017). Post-normal design research: The role of practice-based research in the era of neoliberal risk. In L. Vaughan (Ed.), *Practice-based design research* (pp. 29–39). London: Bloomsbury.
Tunstall, E. (2007). *In design we trust: Design, governmentality, and the tangibility of governance.* Paper presented at the 7th IASDR International Association of Societies of Design Research, Hongkong, China.
van den Hoven, J. (2017). The design turn in applied ethics. In J. van den Hoven, S. Miller, & T. Pogge (Eds.), *Designing in ethics* (pp. 11–31). Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/9780511844317
Verbeek, P-P. (2005). *What things do: Philosophical reflections on technology, agency, and design*. University Park, PA: Pennsylvania State University Press.
Veselova, E. (2023). Designing with nature for sustainability: Towards a critical approach for including natural nonhuman stakeholders in collaborative and participatory design when designing for sustainability (Doctoral dissertation). Aalto University, School of Arts, Design and Architecture, Department of Design, Eespo, Finland.
Virilio, P. (2006). *Speed and politics* (M. Polizzotti, Trans.). Cambridge, MA: MIT Press.
Wakeford, N. (2014). Unpublished opponent comments to the PhD dissertation of K. Lindström and Å. Ståhl, Malmö University.
Wangel, J. (2011). Exploring social structures and agency in backcasting studies for sustainable development. *Technological Forecasting and Social Change, 78,* 872–882. https://doi.org/10.1016/j.techfore.2011.03.007
Winner, L. (1995). Political ergonomics. In R. Buchanan & V. Margolin (Eds.), *Discovering design: Explorations in design studies* (pp. 146–170). Chicago, IL: The University of Chicago Press.
Woodhouse, E., & Patton, J. W. (Eds.). (2004). Design by society: Science and technology studies and the social shaping of design. *Design Issues, 20*(3), 1–12. https://doi.org/10.1162/0747936041423262
Zoöp (2023). For more life. Retrieved September 5, 2023, from https://zoop.earth/en/

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