A Temporal Vocabulary of Design Events for Research Through Design

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ABSTRACT

Much reporting on research-through-design (RtD) is vague about markers of time and temporal qualities. This lack of temporal attunement risks obscuring important contextual knowledge, hidden labour, material agencies and potential knowledge contributions. We turn to the notion of *the event* to articulate the granularities and nuances of RtD processes with an expanded vocabulary. We draw on prior calls from RtD practitioners, the philosophical roots of *events*, and our previous work with the term in our own research. We describe seven terms to expand the temporal vocabulary of RtD, which can be used to build narratives that emphasize knowledge created along the way, and relieve pressure from the 'final' artifact. Our contributions are 1) design events as an ontological shift and analytical tool and 2) a vocabulary that scaffolds design events as a sensitizing tool. We end with a call for more experimentation of non-chronological narratives of RtD.

CCS CONCEPTS

• **Human-centered computing**; • **Interaction design**; • **Interaction design theory, concepts, and paradigms**;

KEYWORDS

research-through-design, design events, temporality, design process, dissemination, design research, storytelling

1 INTRODUCTION

"When preparing a talk about this RtD project, I felt I didn't need to say everything, but I could point to the surprising moments in this design process. Somehow, saying or acknowledging that this is just a part of a moment in the project removes the pressure from having everything else resolved." (Audrey, written reflection on the Odd Interpreters project [18])

"The temporal dissonance I felt this year was that my travel plans (for projects, conferences and holidays) misaligned with the loom's schedule, including events such as the lab being renovated to put in a wall for sound protection, the time it took to put on the first warp, an intern coming in to weave who finished the warp." (Doenja, written reflection on weaving on a TC2 loom)

"While my collaborator and I had tried (many times) to create a schedule for the project, it dramatically went over time—in every phase." (Audrey, written reflection on the Inner Ear project [19])

"I think failures are often clear, perceivable, and palpable events that are very good at revealing relations or assumptions." (Doenja, written reflection on The Morse Things project [59])

Above are excerpts from our exchanges around the question: **What if we could tell research-through-design stories with a higher sensibility for the interwoven temporalities that shape our practices?** While, in principle, RtD foregrounds the *process* of design [6, 23, 26, 45, 87], for over two decades, many RtD projects have focused heavily on final artifacts and a (chronological) description of the design decisions that have led to that outcome. This overlooks the many twists and turns that emerge through the process, which could also contribute important research insights.

A more recent shift within the discourse does focus on ongoing processes within the RtD, including nonlinear paths [17], failures [28, 39, 59], unreported prototypes [75], loose ends [30] or entwined life events [21, 51]. What we miss in these stories is temporality. In our writing, as well as in (excellent) works of RtD by others, we find mostly loose markers of time: *'soon,' 'quickly,' 'then,' 'right after,' 'after many trials and error,' 'long process,'* — without attention to how these timeframes may be shaping what we learned. We find this a significant oversight: being indifferent to temporality obscures the labour and rigour of the processes. With more thoughtful language around the temporality of a design practice, we argue that researchers may not only present artifacts in a new light but will also articulate better the relations and worlds around these artifacts. This has the potential to create generative starting points not only for analysis and reporting of RtD practices, but also in how we might conceive and work through RtD projects. In this paper, we offer seven terms for a vocabulary that can help us make this shift to take seriously the "through" part of RtD.

We aim to promote narratives of RtD that rely on something other than finished artifacts or success stories. We unpack the potential of *design events*: occasions in RtD processes. We see in this an ontological shift where things, materials, tools, and designers

are not stable but porously intertwined in a world that is *continuously becoming* or, as Ingold would put it, at a constant boil [40]. Events, as a temporal-relational understanding, can also support work that already pays attention to the different (possible) trajectories, whether they long to be extended commitments beyond human lifetimes [24, 53, 78], engage with topics of urgency [10], promote temporal reversal through un-making [62, 68, 83], resist progress and stay with the trouble [2, 35, 63, 71, 73].

Next, we provide a short review of knowledge production in RtD and introduce the notion of the *design event* based on its roots in relational philosophy. The main contribution of this paper is seven terms that scaffold the design event. We end with discussing the vocabulary as a sensitizing tool and a call for more experimentation of non-chronological narratives in RtD publications.

2   KNOWLEDGE PRODUCTION IN RTD

While early examples of RtD focused on the final design artifact as the primary carrier of knowledge (or per Nelson and Stolterman's the ultimate particular [49]), design scholars have long understood that design is first and foremost a process and a practice (e.g. [66, 77]). Within HCI, we continue to debate how we "articulate, validate and constitute the knowledge gained through design research" [37:2429]. Design scholars have argued that design may not generate 'universal theories' but instead contingent, situated knowledge, or 'intermediary design knowledge' [37] in formats such as annotated portfolios [14], strong concepts [38], conceptual constructs [77], design programs [65], workbooks [12, 67, 82], filmmaking [55, 57, 64] and more.

Yet, these conversations often keep finished artifacts as main exemplars. Recent works have called for more visibility of the messy "through" parts of the design process [17, 39]. These stories have always existed but are not often part of academic research dissemination formats. We argue that by broadening our understanding of where knowledge is created in RtD, we will not only find more contributions from RtD, but we also can strengthen the rigour and validity by being more transparent about how artifacts are created and how findings are generated.

Central to this is a need for a different (temporal) narrative. For instance, there is a draw to chronological stories (iterations from ideation to concept development, from final design and fabrication to deployment and testing), but this has its limitations. Gaver et al. argue that by looking at emergence as central to design research, we must "present design research as a journey, not a quest" [29:523]. We have seen examples of alternative temporal narratives in RtD in recent years, such as comparing RtD artifacts across projects or labs (e.g. [13]), changing theoretical framings of an artifact over time [33], or presenting abandoned directions or prototypes [17, 30, 75].

When we move away from telling the success story of design work that culminates in a final artifact and deployment study, we argue that we also need a vocabulary around time and temporality. Which parts of the process are worth reflecting on? Which of the 'aha' moments are interesting for others to read about? Which of the many broken prototypes hold important lessons? What do we pay attention to, and how does that change how we document, write up, and do design research? And, to the point of this paper,

how might a temporal vocabulary help us attune ourselves to events along the way?

3   THE DESIGN EVENT

We turn to the notion of *event* to articulate temporalities in design research with further care, nuance, and generativity. The concept of events has been used in research on documentation examining the need to capture, document, and archive different steps of RtD projects [5, 16]. Our use of design events is separate from goals to capture or document but instead ontologically generative, following prior articulations [42, 81]. We turn to the philosophical and theoretical roots of events and articulate three (non-exhaustive) qualities of events that served as starting points for our development of the vocabulary.

3.1   Everything can be an event;

Events are not only chronological happenings in human time (such as workshops, co-design sessions and hackathons), but also include objects, things, or materials. For example, in Whitehead's description of Egypt's Great Pyramid, he points out that its relations to its surroundings are different today than yesterday — and therefore, it does not exist, but is happening [80]. In other words, one can never stand in the same river twice as the water flowing through will not pass again. This should resonate with designers: fabrics wear and tear, prototypes fall apart, wood expands and shrinks, metal rusts and oxidizes, and code gets bricked. Things are not stable but are always in a state of becoming, and therefore, *everything* can be seen as an event. The terms in our vocabulary further enable this shift in seeing the world as ongoing.

3.2   Events are porous;

Put simply, events are occasions in which some difference can be observed [46, 74]. The pace at which a difference is revealed and who observes it depends on how events are cut or defined. Yet, an event does not occur in isolation and it is often not clearly bound: any definition is porous. Wilkie and Michael argue that as events are porous, so are design researchers engaging with them: "[...] to observe or run a research or design event is also to be a part of an event, and thus to be open to change oneself" [81:3] They further point out that "what the designer believes enters the event is not necessarily what actually enters" [81:4]. The role of the designers is not to provide an exact definition, but to become more attuned to what any construction of events includes and excludes. With our vocabulary, we enable propositions for ways of seeing and articulating how time is materialized and expressed. Our terms are not meant to be exclusive: one event can fit multiple terms. The terms can be seen as different lenses to be tried on for fit: prioritizing certain temporalities to reveal the actors and relations exposed within them.

3.3   Events are non-anthropocentric;

Lastly, events are non-anthropocentric in their generous inclusive understanding of actors that are (part of) an event. They are also non-anthropocentric in that they do not prioritize human or calendar time as we know it. Important to note in this shift is a focus

not on how things are defined by time but how they embody, express, actively shape, act and own their time, or, following Barad: how matter does time [4]. The events in our vocabulary attend to nonhuman time and offer opportunities for non-chronological organization.

4 BUILDING THE VOCABULARY THROUGH OUR PRACTICES

We created our temporal vocabulary by building on this understanding of design events with experiences in our RtD practices. We each turned to design events for different, yet complementary, reasons, as we share below.

4.1 Reflecting on our past design events

Doenja used design events as a non-anthropocentric framing to accentuate more-than-human stories [58]. Her first use of design events was applied retrospectively to make sense of multiple moments leading to a failed deployment study [59]. She then actively worked with it in data analysis, resisting binaries such as failures and successes to instead present ongoing and in-progress design work [56, 58]. Audrey first turned to *design events* after struggling to find the right way to narrate the story of a long-term RtD project—after a manuscript was rejected twice [18]. It felt like the project had important 'learnings' both in the making and debugging of the artifacts that were created, as well as the deployment of the artifacts within her team's homes. Design events became an important analytical tool to edit Audrey's and her team's design journey and tease out contributions at all these points in time.

We each saw value in using temporally bound units of analysis to look at our work. Design events offered a mindset where we could narrow in on a lesson from within the design process without directly relating it to the broader project (i.e., the full design concept or the final deployment). There was something liberating about writing in this profound and yet incomplete way.

Yet, this new analytical approach also presented challenges. The first challenge of working with events is that they are hard to see in practice. The importance or significance of an occurrence often only becomes understandable in retrospect. In other words, how do we recognize that we are in the middle of an event? Our motivation for the vocabulary below was to create a sensitizing tool that can help keep an eye on these critical moments or periods of time and scaffold the analyses of RtD projects or events in hindsight. Secondly, we also found it challenging to bracket events: Can an event include other shorter events or overlap with another one? Why do some significant events feel like a sharp half-second moment while others are more like multi-week phases? Once we started looking at the term, we realized that 'event' might still be too broad to accurately describe the different temporal 'things' we saw in our work. This prompted us to further investigate.

4.2 Developing the vocabulary

The propositions for a vocabulary on design events presented in the next section were developed over multiple writing and discussion sessions between the authors. Inspired by first-person work, we loosely followed approaches such as duo-ethnography [39] and design memoirs [21]: we each reflected on our RtD practices and

used examples from specific projects to illustrate some thoughts or questions. To see events, we turned to comments on a Figma board, team communications on Slack or other messaging systems (a question raised, a frustration expressed, etc.) or more personal and spontaneous communication such as Instagram stories. In our teams, we also found that in-progress critiques and end-of-quarter reflections held important intermediary knowledge. Many materials created as instructions within or beyond a team exposed design knowledge that was true at certain moments in the design process.

Our analytical work started with each of us writing an account of our practices focusing on the different temporalities we felt. We aimed to better understand our work with design events by asking each other (asynchronous) questions such as: How did you use design events (within which practice, with what data)? What are the temporalities that emerged in the project/practice? And what different types of knowledge emerged from the project using design events? From here, we came to understand the importance of a shared vocabulary and grouped together examples resulting in seven terms. The presented terms are not meant as a finite, complete vocabulary—rather, we offer it as a malleable start to be shaped and iterated on. We encourage RtD practitioners to use this vocabulary, expand on it, and find which design events might appear in their practices.

5 A TEMPORAL VOCABULARY OF DESIGN EVENTS

We use design events as an umbrella concept and see the additional terms as scaffolds that can help better see the character, quality, and experience of events. Below, we give short descriptions of the temporal notations accompanied by examples from our practices. We want to re-emphasize how design events are porous and inter-related and how they can be cumulative. In other words, they can build on each other (for example, multiple Moments can become Rhythms), and relations such as Temporal dissonances might be revealed when placed side by side. We have illustrated some of these instances by creating cross-references in the vocabulary.

5.1 Moments

Moments are brief events or sharp snippets in which something perceivably occurs, like an LED indicator switching on, thread breaking, ceramic cracking, or a deadline passing.

For example, the moment of multiple internet-connected ceramic cups breaking in shipping (Figure 1) was the third occasion of breakage that, in their accumulation, revealed greater fragility of socio-technical systems that IoT devices find themselves in, including shipping services, different time zones, battery life, and material fragility.

Moments can reveal previously under-considered relations, such as material relations between different parts of an artifact or system or social relations in the design team or larger social context of the project. Other scholars have recognized the generative potential of breakdown as an expository tool for hidden agencies and networks [8, 41]. Beyond breakdown, moments can also include trivial or purely processual events in a design project that could gain meaning accumulatively or turn into other types of events. Taking seriously

Figure 1: Three different moments of breakage in the Morse Things project [59] allowed (or forced) to embrace fragility in the theoretical framing. From top left, clockwise: A cup breaking in the process of designing custom packaging, the same cup breaking after it had been repaired with kintsugi, and finally, multiple cups and bowls breaking in shipping.

the potential knowledge hidden in moments means a deeper look at what might appear as mundane happenings.

5.2   Encounters

Encounters are instances where separate actors come together or gather, for example, when laser cutting, 3D printing or CNCing a new material (machine encountering material), planned (human) encounters such as (online) project meetings, or assembling parts of the final object. Encounters don't have to include human actors and can play out over more extended periods than Moments. For example, Odom and Wakkary describe encounters between everyday objects that, over time, form ensembles, such as a pair of glasses, a diary, a glass of water and a reading light on a nightstand [52].

To illustrate encounters as design events, we reflect on the prototyping process to build Broadcast, a device that listens for home WiFi traffic and activates when WiFi traffic is detected [18]. While prototyping during the COVID-19 pandemic, the prototype moved across the homes of different team members (Figure 2, top). Every encounter between the new WiFi networks and the device demonstrated new and unexpected behavior of our code. This collection of encounters eventually led us to reflect much more deeply on WiFi 'full' and WiFi 'sparse' environments and how these environments were distributed within our own team. In another example (Figure 2, bottom), an unexpected participant (a snail) presented itself in an encounter, prompting reflection on the definitions of participation in this project.

Encounters, particularly those where new actors come together, are potent for knowledge generation and can be more actively enabled in RtD projects. It is also an event that can reveal the conditions that allow actors to gather. Encounters can enable understanding of different response-abilities [32] of entities in the design project.

5.3   Transitions

Transitions happen when tasks are taken over, materials are changed, or prototypes or samples are left behind (Figure 3).

In one of our projects, an instructional file and set of woven fabric samples were prepared to assist a team member in a different country in weaving a previously designed draft. The loom she was weaving on had a different configuration than what the draft was created for, and she was working with different materials. Because of this, the instructions had to be detailed enough for her to understand how the original samples were constructed, which parameters were considered, and where she could alter and adjust. The instructions were made with a level of detail and care that is
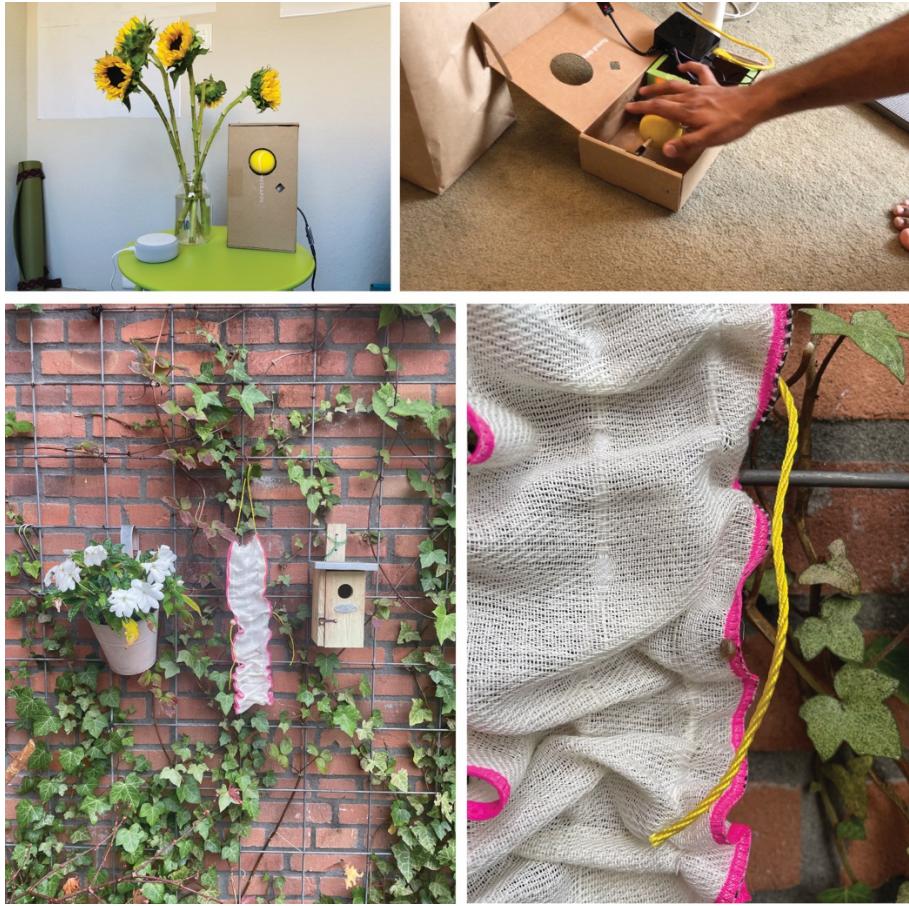
Figure 2: Top: A prototype present in different homes behaves differently, forcing many rounds of debugging with the code. Bottom: A different type of encounter during a pilot deployment of a shape-changing textile initiated as a collaboration with rainy weather: a snail appeared after a couple of days. This encounter prompted reflection on who is invited or prioritized to collaborate in more-than-human design work.

not easily translatable to other projects. The instructional can be considered a type of in-process 'ultimate particular' and share a likeness with alternative design research dissemination such as DIY tutorials [20] or open-source and self-build platforms [27].

Transitions announce a state of being between events, Moments, Pauses, or other. In this, transitions are indicators for potential knowledge externalization and contributions. Also, the tools created during transitions, such as reports, instructions, or translations, are important indirect data sources containing tacit design knowledge.

5.4 Pauses

Pauses can be short or long events that indicate moments of waiting, doing nothing, staying still, and standing back. They can include intentional pauses, as described by Yoo and Friedman [25], or pauses introduced by material curing or drying time, supply chain issues, or repair and maintenance.

For example, in the Odd Interpreters project, SA's team wanted to develop an artifact that would display the changes in sunlight over time [18]. The team wanted to test if natural hand-dyed fabric (without a fixative) could fade noticeably over time. After dying different fabrics with a few dyes (Figure 4), we had to wait six weeks to see the results and decide which combination to choose. During that period of waiting, other parts of the work could still happen (the coding of the Arduino and the design of the encasing to be 3D printed). Yet, it felt like no final decisions could be made because they were contingent on the final fabric and dye. Working in this state of 'moving forward' yet remaining open to future changes created a space where experimentation and contemplation were welcome. When embraced, pauses can be generative and reveal deep insights. Even if things appear as passive – they might be on their way to becoming active.

5.5 Rhythms

Rhythms are recurring events that can be repetitive, predictable, cyclical, or appear as a pattern. Rhythms can take place beyond the project, such as seasons (see Figure 5, right), deadlines, and

Figure 3: Top: Instructional file for a woven fabric. Bottom left: example of a material transition, representing colors chosen for paint side by side with printed ink on paper, painted swatches on paper and on 3d printed materials. Bottom right: labelling different yarns to communicate with a team member.

academic calendars. But materials, tools, and machines of the project itself have a pace and tempo, too (see also Other-time).

In our practices, we found that rhythms can play shaping roles. In multiple projects of Doenja, a TC2 jacquard loom is used to weave on (Figure 5, left). For this, the loom needs to be periodically warped—a time-consuming process in which new yarn is wound on the beam led through the heddle and tied on. This process strongly influences the planning of the projects and what can and cannot be woven at a given time. The warping process also promotes moments in which people gather to use up the remaining yarn, plan the next projects roughly, and warp the loom. This material-determined rhythm inadvertently creates points of reflection and futuring (e.g. planning or fantasizing new projects) within a studio or lab. Acknowledging rhythms and how they influence project work is essential in a more relational understanding of RtD practices. It can be generative in defining the projects and researchers' positionality in a broader context.

5.6 Other-time

Other-time refers to the temporal lifeworld of non-researchers in the project that may influence or prompt events, such as machine-time (looms, 3D printers), material-time, participant-time, as well as political events or personal life events.

For instance, working with clay involves many steps, regardless of the fabrication technique (3D printing, slip casting, etc.). Clay needs to be wedged and prepared before it can be printed. Once shaped, it has to dry and be trimmed. It is bisque-fired and may or may not get glazed and fired again. Every step takes time and is hard to predict as it depends on the temperature and humidity in the studio (Figure 6) and cannot be influenced by the researcher's agenda or timeline.

Events such as Pauses and Temporal dissonances allow other-time to unfold – as its temporalities may take longer to unfurl or resonate. Paying attention to and taking stock of other-time is important to anticipate events in RtD projects better and to give other agencies a more active role in design processes.

Figure 4: Nine swatches of hand dyed fabrics to be exposed to the sun for multiple weeks while we wait for them to fade.
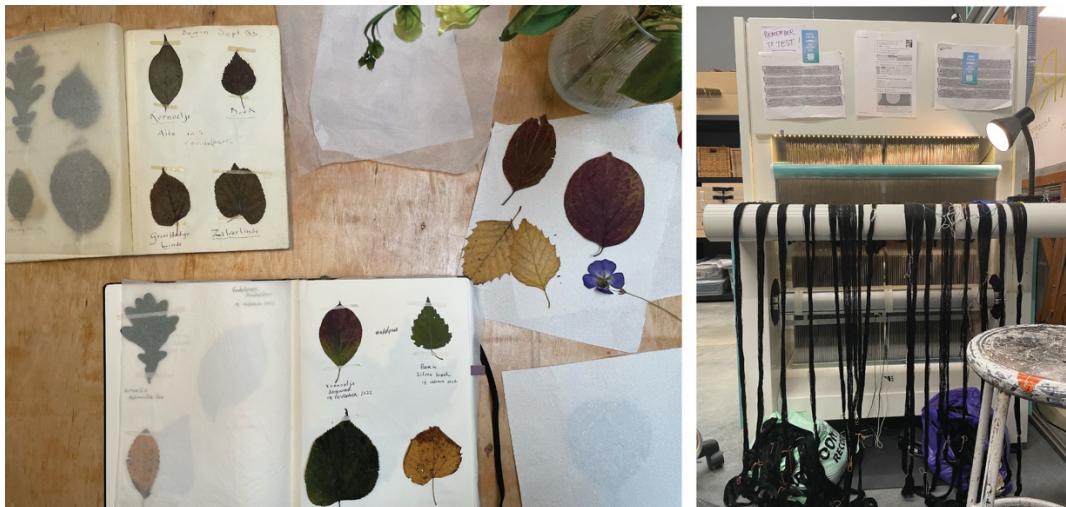

Figure 5: Left: A TC2 Jacquard loom mid-warping process. Right: a project of Doenja using herbariums as a tool for noticing, in which they are revisiting and recreating an existing herbarium. Seasonal rhythms and cycles of trees, shrubs and grasses determine whether samples for the herbarium can be collected, and by effect, when Doenja can work on this project.

5.7 Temporal dissonances

Temporal dissonances become clear when events clash, for example, the rhythm of seasons (in doing multispecies work) not working out with publishing timelines (such as conference deadlines that prompt the work to be written up in certain moments).

Temporal dissonances are illustrated well when clay-time (see Other-time) met participant-time (Figure 7). The Inner Ear project

Figure 6: Left: Ceramic pieces at different stages: ring fresh off the 3d printer (front right), central module drying (back left), and central module waiting to be trimmed and sanded before bisque firing (front left).

Figure 7: Temporal dissonance between (Left) clay-time—the multi-step production and assembly process of the ceramic pieces, and availability to meet with the research and filming team (right).

[19] involved slip-casting central modules, deploying them to capture data with six participants, collecting them back, 3D printing data physicalizations rings, assembling these rings with the central modules and deploying them back with participants. Clay-time was already filled with uncertainty, which was only exacerbated by the scheduling complexities of matching participants' time with our team's availability for meeting with them.

Temporal dissonances do not necessarily prompt pauses or slowing down; they can also be starting points for fabulations. In Figure 8, Doenja worked with missing information created by temporal dissonance in the herbarium project (as described in Rhythms). While the shrub she was looking for was not in bloom, she speculated on the possible colors of the flowers.

Temporal dissonances can reveal material agencies that are not obvious and need careful attunement to find opportunities to work actively with (see [47, 86]). They also reveal the multiple temporalities existing within a project and can sensitize designers towards a more open attitude toward this plurality.

6 EXPANDING, INTERTWINING AND NARRATING THE TEMPORALITIES OF RTD

With this work, we encourage other design researchers and RtD practitioners to attune themselves to the temporalities that exist in their processes. A first step for working with design events is to 'see' them. Our call is not to build new tools for capturing the temporal qualities of RtD projects (as others have suggested previously, e.g. [16]); instead, we argue that temporal markers are already hiding in plain sight.
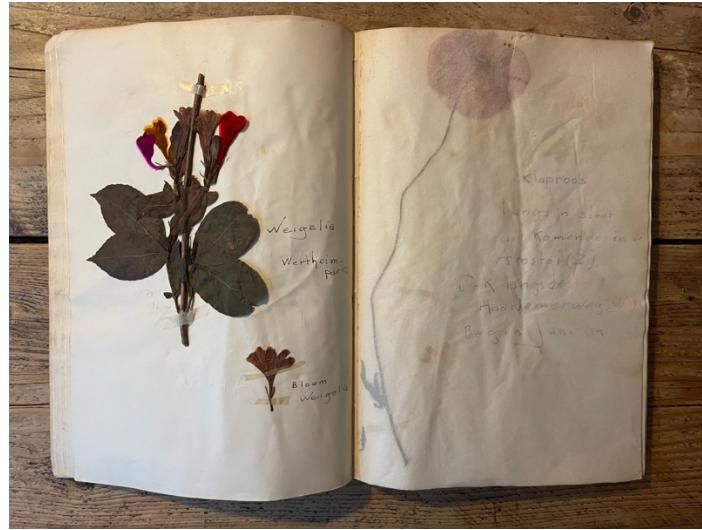
Figure 8: Page from the Herbarium with fabulated colors for the Weigelia sample, which can be either pink, red or yellow depending on the specific type of Weigelia.

6.1 A vocabulary for sensitizing

Our intention to create a sensitizing tool is to allow design researchers to see the knowledge contributions within their ongoing design work. The goal was to go beyond 'trusting the process' to respecting the process and embracing the ongoing becoming and 'knowing' that happens along the way. Yet, when writing the examples for each design event above, we found friction when trying to articulate what exact knowledge was generated within specific events (i.e. how might design events offer generativity). Design insights occur across events and require forms of storytelling (synthesizing, organizing, narrating) to yield new knowledge. However, our point stands: design researchers need to be attuned to parts of the story (or events) before telling a full story. Using the vocabulary to see and name events along the way is an important step.

Furthermore, a new attunement to design events will challenge how design researchers plan or conduct their projects. For instance, in some of our projects, we have started to plan phases of the work according to the seasonal Rhythms, exposed our work to enable unexpected Encounters, and are taking photographs of more mundane Moments in anticipation that some of them might grow into knowledge. Various events emphasize how other actors gather (Encounters, Transitions, Other-time, Temporal dissonances). These will become generative once we understand design as relational and acknowledge their positionality amongst broader contexts. While the vocabulary we offer may help see the interwoven timescales of a practice, the challenge is in deciding how to find points of alignment across actors, even through layers of agency, power, and labor. Finally, design events can be generative by shifting how design researchers think of process-oriented knowledge externalization. While we often think that a quick instruction or a note left for the next person to use a tool are temporary, with design events (especially Transitions), we may realize that these expressions of tacit knowledge would benefit from care when being created (which may extend their longevity).

6.2 Promoting different forms of narrative

Stories are inherently temporal formats that can weave together different types of temporalities, allowing for more connected and relational types of knowledge. Events hold potential as ingredients for storytelling forms suited for the messy, asynchronous, and non-linear ways of RtD to explore forms of narrative and uses of language. It has previously been argued that HCI would benefit from a better understanding of basic plots for storytelling [11]. Design events extend this call with *temporal narrative structures*. For example, researchers can shape the temporal environment by using serial or episodic stories, combining multiple individual stories (duology, trilogy, tetralogy or polyphonies), building stories within stories, retelling the same story from different perspectives, or making use of a frame story in which segmented events are tied together by a central one. They can also experiment with temporal order through flashbacks, flashforwards, stories that begin right in the middle or using language to elongate or shorten time.

With design events, we offer building blocks for such temporal narratives that can be woven together differently. We could see design events being used as an analytical tool for auto-speculation [44], fabulations [72], or diffractive analysis [50, 69, 79]. We also see opportunities in works that have experimented with publication formats and dissemination [34, 60, 61, 84]. For example, Helms' reflections invite the reader to print out the poems and redistribute the pages to engage with them spatially rather than chronologically [34]. This could work well for entangling events like Moments, Rhythms, and Transitions. Our invitation to the community is to use the vocabulary to experiment with temporal form and structure in research narratives. Lastly, while our focus in this paper has been on RtD specifically, we invite adjacent practices such as material-driven research [9, 15, 43, 47], soma-design [36, 76], biodesign [7, 54, 86], digital fabrication and craftsmanship [1, 3, 22, 31, 48, 85] and design research more broadly to take up and adjust these terms for fit too.

7 CONCLUSION

To conclude, we have proposed seven terms to cultivate a stronger temporal sensitivity in research-through-design: *moments, encounters, transitions, pauses, rhythms, other-time,* and *temporal dissonance.* Together, design events have the potential to shift how we conceive, conduct, and report on RtD projects — offering care and attention to elements we might have been indifferent to before. We argue that this ontological shift towards the temporal nature of RtD (or the constant becoming of materials, tools, designers, infrastructures) can expose relations and new learnings. Our final call is towards more transparent and open reporting on the unexpected, weird, and non-rational things that happen in design. Here, we argue that our design events vocabulary will not 'tell' designers which events are significant to report on — we trust designers will know to recognize their contributions. But we believe that this vocabulary can help build an analytical attunement towards events (quick, long, cyclical, relational, etc.) that allows designers to hold on to, gather, expand on, and work with them: the first step to looking at and reporting on RtD practice differently.

ACKNOWLEDGMENTS

REFERENCES

[1] Lea Albaugh, Scott Hudson, and Lining Yao. 2019. Digital Fabrication of Soft Actuated Objects by Machine Knitting. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (CHI '19), 1–13. https://doi.org/10.1145/3290605.3300414

[2] Kristina Andersen, Laura Devendorf, James Pierce, Ron Wakkary, and Daniela K. Rosner. 2018. Disruptive Improvisations: Making Use of Non-Deterministic Art Practices in HCI. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems* (CHI EA '18), 1–8. https://doi.org/10.1145/3170427.3170630

[3] Kristina Andersen, Ron Wakkary, Laura Devendorf, and Alex McLean. 2019. Digital crafts-machine-ship: creative collaborations with machines. *Interactions* 27, 1: 30–35. https://doi.org/10.1145/3373644

[4] Karen Barad. 2013. 2 Ma(r)king Time: Material Entanglements and Rememberings: Cutting Together-Apart1. In *How Matter Matters: Objects, Artifacts, and Materiality in Organization Studies*, Paul R. Carlile, Davide Nicolini, Ann Langley and Haridimos Tsoukas (eds.). Oxford University Press, 0. https://doi.org/10.1093/acprof:oso/9780199671533.003.0002

[5] Jeffrey Bardzell, Shaowen Bardzell, Peter Dalsgaard, Shad Gross, and Kim Halskov. 2016. Documenting the Research Through Design Process. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems* (DIS '16), 96–107. https://doi.org/10.1145/2901790.2901859

[6] Jeffrey Bardzell, Shaowen Bardzell, and Lone Koefoed Hansen. 2015. Immodest Proposals: Research Through Design and Knowledge. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (CHI '15), 2093–2102. https://doi.org/10.1145/2702123.2702400

[7] Fiona Bell, Michelle Ramsahoye, Joshua Coffie, Julia Tung, and Mirela Alistar. 2023. *µMe: Exploring the Human Microbiome as an Intimate Material for Living Interfaces. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (DIS '23), 2019–2033. https://doi.org/10.1145/3563657.3596133

[8] Jane Bennett. 2005. The Agency of Assemblages and the North American Blackout. *Public Culture* 17, 3: 445–466. https://doi.org/10.1215/08992363-17-3-445

[9] Jenny Bergström, Brendon Clark, Alberto Frigo, Ramia Mazé, Johan Redström, and Anna Vallgårda. 2010. Becoming materials: material forms and forms of practice. *Digital Creativity* 21, 3: 155–172. https://doi.org/10.1080/14626268.2010.502235

[10] Heidi R. Biggs and Audrey Desjardins. 2020. High Water Pants: Designing Embodied Environmental Speculation. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (CHI '20), 1–13. https://doi.org/10.1145/3313831.3376429

[11] Mark Blythe. 2017. Research Fiction: Storytelling, Plot and Design. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems.* Association for Computing Machinery, New York, NY, USA, 5400–5411. Retrieved August 14, 2021 from http://doi.org/10.1145/3025453.3026023

[12] Mark Blythe, Enrique Encinas, Jofish Kaye, Miriam Lueck Avery, Rob McCabe, and Kristina Andersen. 2018. Imaginary Design Workbooks: Constructive Criticism and Practical Provocation. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems.* Association for Computing Machinery, New York, NY, USA, 1–12. Retrieved August 14, 2021 from http://doi.org/10.1145/3173574.3173807

[13] Andy Boucher. 2023. Research Products at Scale: Learnings from Designing Devices in Multiples of Ones, Tens, Hundreds and Thousands. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (CHI '23), 1–15. https://doi.org/10.1145/3544548.3581540

[14] John Bowers. 2012. The logic of annotated portfolios: communicating the value of "research through design." In *Proceedings of the Designing Interactive Systems Conference* (DIS '12), 68–77. https://doi.org/10.1145/2317956.2317968

[15] Alice Buso, Holly McQuillan, Milou Voorwinden, and Elvin Karana. 2023. Weaving Textile-form Interfaces: A Material-Driven Design Journey. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (DIS '23), 608–622. https://doi.org/10.1145/3563657.3596086

[16] Peter Dalsgaard and Kim Halskov. 2012. Reflective design documentation. In *Proceedings of the Designing Interactive Systems Conference* (DIS '12), 428–437. https://doi.org/10.1145/2317956.2318020

[17] Audrey Desjardins and Cayla Key. 2020. Parallels, Tangents, and Loops: Reflections on the "Through" Part of RtD. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference* (DIS '20), 2133–2147. https://doi.org/10.1145/3357236.3395586

[18] Audrey Desjardins, Jena McWhirter, Justin Petelka, Chandler Simon, Yuna Shin, Ruby K Peven, and Philbert Widjaja. 2023. On the Making of Alternative Data Encounters: The Odd Interpreters. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (CHI '23), 1–20. https://doi.org/10.1145/3544548.3581323

[19] Audrey Desjardins, Timea Tihanyi, Freesoul El Shabazz-Thompson, Brock Craft, and Julia Saimo. 2023. The Inner Ear: Capturing and Physicalizing Home Vibrations. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (DIS '23), 594–607. https://doi.org/10.1145/3563657.3596070

[20] Audrey Desjardins, Ron Wakkary, Will Odom, Henry Lin, and Markus Lorenz Schilling. 2017. Exploring DIY tutorials as a way to disseminate research through design. *Interactions* 24, 4: 78–82. https://doi.org/10.1145/3098319

[21] Laura Devendorf, Kristina Andersen, and Aisling Kelliher. 2020. Making Design Memoirs: Understanding and Honoring Difficult Experiences. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (CHI '20), 1–12. https://doi.org/10.1145/3313831.3376345

[22] Laura Devendorf and Kimiko Ryokai. 2015. Being the Machine: Reconfiguring Agency and Control in Hybrid Fabrication. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (CHI '15), 2477–2486. https://doi.org/10.1145/2702123.2702547

[23] Christopher Frayling. 1993. Research in Art and Design. *Research in Art and Design (Royal College of Art Research Papers)* 1, 1. Retrieved from http://researchonline.rca.ac.uk/384/

[24] Batya Friedman, Lisa P. Nathan, and Daisy Yoo. 2017. Multi-Lifespan Information System Design in Support of Transitional Justice: Evolving Situated Design Principles for the Long(er) Term. *Interacting with Computers* 29, 1: 80–96. https://doi.org/10.1093/iwc/iwv045

[25] Batya Friedman and Daisy Yoo. 2017. Pause: A Multi-lifespan Design Mechanism. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (CHI '17), 460–464. https://doi.org/10.1145/3025453.3026031

[26] William Gaver. 2012. What Should We Expect from Research Through Design? In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '12), 937–946. https://doi.org/10.1145/2207676.2208538

[27] William Gaver, Andy Boucher, Dean Brown, David Chatting, Naho Matsuda, Liliana Ovalle, Andy Sheen, and Michail Vanis. 2022. Yo–Yo Machines: Self-Build Devices that Support Social Connections During the Pandemic. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (CHI '22), 1–17. https://doi.org/10.1145/3491102.3517547

[28] William Gaver, John Bowers, Tobie Kerridge, Andy Boucher, and Nadine Jarvis. 2009. Anatomy of a failure: how we knew when our design went wrong, and what we learned from it. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '09), 2213–2222. https://doi.org/10.1145/1518701.1519040

[29] William Gaver, Peter Gall Krogh, Andy Boucher, and David Chatting. 2022. Emergence as a Feature of Practice-based Design Research. In *Designing Interactive Systems Conference* (DIS '22), 517–526. https://doi.org/10.1145/3532106.3533524

[30] Bruna Goveia da Rocha, Kristina Andersen, and Oscar Tomico. 2022. Portfolio of Loose Ends. In *Designing Interactive Systems Conference* (DIS '22), 527–540. https://doi.org/10.1145/3532106.3533516

[31] Bruna Goveia da Rocha, Oscar Tomico, Panos Markopoulos, and Daniel Tetteroo. 2020. Crafting Research Products through Digital Machine Embroidery. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference* (DIS '20), 341–350. https://doi.org/10.1145/3357236.3395443

[32] Donna J. Haraway. 2016. *Staying with the Trouble: Making Kin in the Chthulucene.* Duke University Press Books, Durham.

[33] Sabrina Hauser, Ron Wakkary, William Odom, Peter-Paul Verbeek, Audrey Desjardins, Henry Lin, Matthew Dalton, Markus Schilling, and Gijs de Boer. 2018. Deployments of the Table-non-table: A Reflection on the Relation Between Theory and Things in the Practice of Design Research. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (CHI '18), 201:1-201:13. https://doi.org/10.1145/3173574.3173775

[34] Karey Helms. 2021. Entangled Reflections on Designing with Leaky Breastfeeding Bodies. In *Designing Interactive Systems Conference 2021* (DIS '21), 1998–2012. https://doi.org/10.1145/3461778.3462048

[35] Sarah Homewood. 2019. Inaction as a Design Decision: Reflections on Not Designing Self-Tracking Tools for Menopause. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (CHI EA '19), 1–12. https://doi.org/10.1145/3290607.3310430

[36] Kristina Höök. 2018. *Designing with the Body: Somaesthetic Interaction Design.* The MIT Press, Cambridge, Massachusetts.

[37] Kristina Höök, Peter Dalsgaard, Stuart Reeves, Jeffrey Bardzell, Jonas Löwgren, Erik Stolterman, and Yvonne Rogers. 2015. Knowledge Production in Interaction Design. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems* (CHI EA '15), 2429–2432. https://doi.org/10.1145/2702613.2702653

[38] Kristina Höök and Jonas Löwgren. 2012. Strong Concepts: Intermediate-level Knowledge in Interaction Design Research. *ACM Trans. Comput.-Hum. Interact.* 19, 3: 23:1-23:18. https://doi.org/10.1145/2362364.2362371

[39] Noura Howell, Audrey Desjardins, and Sarah Fox. 2021. Cracks in the Success Narrative: Rethinking Failure in Design Research through a Retrospective Trioethnography. *ACM Transactions on Computer-Human Interaction* 28, 6: 42:1-42:31. https://doi.org/10.1145/3462447

[40] Tim Ingold. 2011. *Being alive: essays on movement, knowledge and description / Tim Ingold.* Routledge, London; New York.

[41] Steven J. Jackson. 2014. Rethinking Repair. In *Media Technologies.* The MIT Press. https://doi.org/10.7551/mitpress/9780262525374.003.0011

[42] Li Jönsson. 2015. Design events: on explorations of a non-anthropocentric framework in design. The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation, Kbh.

[43] Elvin Karana, Elisa Giaccardi, Niels Stamhuis, and Jasper Goossensen. 2016. The Tuning of Materials: A Designer's Journey. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*, 619–631. https://doi.org/10.1145/2901790.2901909

[44] Brian Kinnee, Audrey Desjardins, and Daniela Rosner. 2023. Autospeculation: Reflecting on the Intimate and Imaginative Capacities of Data Analysis. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (CHI '23), 1–10. https://doi.org/10.1145/3544548.3580902

[45] Ilpo Koskinen, John Zimmerman, Thomas Binder, Johan Redstrom, and Stephan Wensveen. 2011. *Design Research Through Practice: From the Lab, Field, and Showroom.* Morgan Kaufmann, Waltham, MA.

[46] Bruno Latour. 1999. *Pandora's Hope: Essays on the Reality of Science Studies.* Harvard University Press.

[47] Szu-Yu (Cyn) Liu, Jeffrey Bardzell, and Shaowen Bardzell. 2019. Decomposition As Design: Co-Creating (with) Natureculture. In *Proceedings of the Thirteenth International Conference on Tangible, Embedded, and Embodied Interaction* (TEI '19), 605–614. https://doi.org/10.1145/3294109.3295653

[48] Troy Robert Nachtigall. 2019. Materializing data: craftsmanship and technology for ultra-personalization. Technische Universiteit Eindhoven, Eindhoven.

[49] Harold G. Nelson and Erik Stolterman. 2012. The Design Way: Intentional Change in an Unpredictable World. The MIT Press.

[50] Charlotte Nordmoen and Andrew P. McPherson. 2022. Making space for material entanglements: A diffractive analysis of woodwork and the practice of making an interactive system. In *Designing Interactive Systems Conference* (DIS '22), 415–423. https://doi.org/10.1145/3532106.3533572

[51] Claudia Núñez-Pacheco and Emma Frid. 2023. Sharing Earthquake Narratives: Making Space for Others in our Autobiographical Design Process. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (CHI '23), 1–18. https://doi.org/10.1145/3544548.3580977

[52] William Odom and Ron Wakkary. 2015. Intersecting with Unaware Objects. In *Proceedings of the 2015 ACM SIGCHI Conference on Creativity and Cognition* (C&C '15), 33–42. https://doi.org/10.1145/2757226.2757240

[53] William Odom, Ron Wakkary, Ishac Bertran, Matthew Harkness, Garnet Hertz, Jeroen Hol, Henry Lin, Bram Naus, Perry Tan, and Pepijn Verburg. 2018. Attending to Slowness and Temporality with Olly and Slow Game: A Design Inquiry

[54] Netta Ofer, Fiona Bell, and Mirela Alistar. 2021. Designing direct interactions with bioluminescent algae. 1230–1241.

[55] Wyatt Olson, Freesoul El Shabazz-Thompson, Melanie Wells, Janey Yee, Julia R Saimo, Bill Xiong, Brock Craft, and Audrey Desjardins. 2023. Exposing Tensions in Documentary Filmmaking for Design Research: The Inner Ear Shorts. In *Companion Publication of the 2023 ACM Designing Interactive Systems Conference* (DIS '23 Companion), 198–202. https://doi.org/10.1145/3563703.3596633

[56] Doenja Oogjes. 2022. Repertoires for designing with nonhumans. Simon Fraser University, Vancouver, Canada. Retrieved February 2, 2024 from https://summit.sfu.ca/item/34946

[57] Doenja Oogjes and Ron Wakkary. 2017. Videos of Things: Speculating on, Anticipating and Synthesizing Technological Mediations. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (CHI '17), 4489–4500. https://doi.org/10.1145/3025453.3025748

[58] Doenja Oogjes and Ron Wakkary. 2022. Weaving Stories: Toward Repertoires for Designing Things. In *CHI Conference on Human Factors in Computing Systems.* Retrieved from https://doi.org/10.1145/3491102.3501901

[59] Doenja Oogjes, Ron Wakkary, Henry Lin, and Omid Alemi. 2020. Fragile! Handle with Care: The Morse Things. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference* (DIS '20), 2149–2162. https://doi.org/10.1145/3357236.3395584

[60] Jeroen Peeters, Marlies Peeters, and Ambra Trotto. 2017. Exploring Active Perception in Disseminating Design Research. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (DIS '17), 1395–1407. https://doi.org/10.1145/3064663.3064789

[61] Jeroen Peeters, Rosa van der Veen, and Ambra Trotto. 2020. Pictorial Unleashed: Into the Folds of Interactive Qualities. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference* (DIS '20), 925–938. https://doi.org/10.1145/3357236.3395570

[62] James Pierce. 2012. Undesigning Technology: Considering the Negation of Design by Design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '12), 957–966. https://doi.org/10.1145/2207676.2208540

[63] 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* (CHI '21), 1–19. https://doi.org/10.1145/3411764.3445406

[64] Bas Raijmakers, William W. Gaver, and Jon Bishay. 2006. Design Documentaries: Inspiring Design Research Through Documentary Film. In *Proceedings of the 6th Conference on Designing Interactive Systems* (DIS '06), 229–238. https://doi.org/10.1145/1142405.1142441

[65] Johan Redström. 2017. *Making Design Theory.* The MIT Press, Cambridge, Massachusetts.

[66] Horst W. J. Rittel and Melvin M. Webber. 1973. Dilemmas in a general theory of planning. *Policy Sciences* 4, 2: 155–169. https://doi.org/10.1007/BF01405730

[67] Niek Rutten, Jef Rouschop, Louise Mathiasen, Oscar Tomico, Bruna Goveia Da Rocha, and Kristina Andersen. 2022. Flipping Pages: Exploring Physical Workbooks as Reflective Method for Documentation. In *Nordic Human-Computer Interaction Conference* (NordiCHI '22), 1–14. https://doi.org/10.1145/3546155.3547296

[68] Samar Sabie, Robert Soden, Steven Jackson, and Tapan Parikh. 2023. Unmaking as Emancipation: Lessons and Reflections from Luddism. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (CHI '23), 1–15. https://doi.org/10.1145/3544548.3581412

[69] Pedro Sanches, Noura Howell, Vasiliki Tsaknaki, Tom Jenkins, and Karey Helms. 2022. Diffraction-in-action: Designerly Explorations of Agential Realism Through Lived Data. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (CHI '22), 1–18. https://doi.org/10.1145/3491102.3502029

[70] Donald A. Schon. 1984. *The Reflective Practitioner: How Professionals Think In Action.* Basic Books, New York.

[71] Vishal Sharma, Neha Kumar, and Bonnie Nardi. 2023. Post-growth Human–Computer Interaction. *ACM Transactions on Computer-Human Interaction* 31, 1: 9:1-9:37. https://doi.org/10.1145/3624981

[72] Marie Louise Juul Søndergaard, Nadia Campo Woytuk, Noura Howell, Vasiliki Tsaknaki, Karey Helms, Tom Jenkins, and Pedro Sanches. 2023. Fabulation as an Approach for Design Futuring. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (DIS '23), 1693–1709. https://doi.org/10.1145/3563657.3596097

[73] Marie Louise Juul Søndergaard and Lone Koefoed Hansen. 2018. Intimate Futures: Staying with the Trouble of Digital Personal Assistants Through Design Fiction. In *Proceedings of the 2018 Designing Interactive Systems Conference* (DIS '18), 869–880. https://doi.org/10.1145/3196709.3196766

[74] Isabelle Stengers. 2000. *The Invention of Modern Science.* U of Minnesota Press.

[75] Nick Taylor, Jon Rogers, Loraine Clarke, Martin Skelly, Jayne Wallace, Pete Thomas, Babitha George, Romit Raj, Mike Shorter, and Michelle Thorne. 2021. Prototyping Things: Reflecting on Unreported Objects of Design Research for IoT. In *Designing Interactive Systems Conference 2021* (DIS '21), 1807–1816. https://doi.org/10.1145/3461778.3462037

[76] Paul Tennent, Kristina Höök, Steve Benford, Vasiliki Tsaknaki, Anna Ståhl, Claudia Dauden Roquet, Charles Windlin, Pedro Sanches, Joe Marshall, Christine Li, Juan Pablo Martinez Avila, Miquel Alfaras, Muhammad Umair, and Feng Zhou. 2021. Articulating Soma Experiences using Trajectories. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (CHI '21), 1–16. https://doi.org/10.1145/3411764.3445482

[77] Ron Wakkary, Audrey Desjardins, and Sabrina Hauser. 2015. Unselfconscious Interaction: A Conceptual Construct. *Interacting with Computers*: iwv018. https://doi.org/10.1093/iwc/iwv018

[78] Ron Wakkary, Doenja Oogjes, and Armi Behzad. 2022. Two Years or More of Co-speculation: Polylogues of Philosophers, Designers, and a Tilting Bowl. *ACM Transactions on Computer-Human Interaction*. https://doi.org/10.1145/3514235

[79] Ron Wakkary, Doenja Oogjes, Nazmus Sakib, and Armi Behzad. 2023. Turner Boxes and Bees: From Ambivalence to Diffraction. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (DIS '23), 790–807. https://doi.org/10.1145/3563657.3596081

[80] Alfred North Whitehead. 1979. *Process and Reality*. Free Press, New York.

[81] Alex Wilkie and Mike Michael. 2023. The aesthetics of more-than-human design: speculative energy briefs for the Chthulucene. *Human–Computer Interaction* 0, 0: 1–13. https://doi.org/10.1080/07370024.2023.2276392

[82] Richmond Y. Wong, Deirdre K. Mulligan, Ellen Van Wyk, James Pierce, and John Chuang. 2017. Eliciting Values Reflections by Engaging Privacy Futures Using Design Workbooks. *Proc. ACM Hum.-Comput. Interact.* 1, CSCW. https://doi.org/10.1145/3134746

[83] Shanel Wu and Laura Devendorf. 2020. Unfabricate: Designing Smart Textiles for Disassembly. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 1–14. Retrieved January 21, 2022 from http://doi.org/10.1145/3313831.3376227

[84] MinYoung Yoo, Lauren Knight, William Odom, and Arne Berger. 2022. Storywork & Reciprocity: On the Design of an Audio Documentary that Extends HCI Research back to Participants. In *Proceedings of the 2022 ACM Designing Interactive Systems Conference* (DIS '22), 1345–1357. https://doi.org/10.1145/3532106.3533539

[85] Clement Zheng, Bo Han, Xin Liu, Laura Devendorf, Hans Tan, and Ching Chiuan Yen. 2023. Crafting Interactive Circuits on Glazed Ceramic Ware. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (CHI '23), 1–18. https://doi.org/10.1145/3544548.3580836

[86] Jiwei Zhou, Raphael Kim, Zjenja Doubrovski, Joana Martins, Elisa Giaccardi, and Elvin Karana. 2023. Cyano-chromic Interface: Aligning Human-Microbe Temporalities Towards Noticing and Attending to Living Artefacts. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (DIS '23), 820–838. https://doi.org/10.1145/3563657.3596132

[87] John Zimmerman, Jodi Forlizzi, and Shelley Evenson. 2007. Research Through Design As a Method for Interaction Design Research in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '07), 493–502. https://doi.org/10.1145/1240624.1240704