Unmaking@CHI: Concretizing the Material and Epistemological Practices of Unmaking in HCI

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ABSTRACT

Design is conventionally considered to be about making and creating new things. But what about the converse of that process – unmaking that which already exists? Researchers and designers have recently started to explore the concept of "unmaking" to actively think about important design issues like reuse, repair, and unintended socio-ecological impacts. They have also observed the importance of unmaking as a ubiquitous process in the world, and its relation to making in an ongoing dialectic that continually recreates our material and technological realms. Despite the increasing attention to unmaking, it remains largely under-investigated and under-theorized in HCI. The objectives of this workshop are therefore to (a) bring together a community of researchers and practitioners who are interested in exploring or showcasing the affordances of unmaking, (b) articulate the material and epistemological scopes of unmaking within HCI, and (c) reflect on frameworks, research approaches, and technical infrastructure for unmaking in HCI that can support its wider application in the field.

CCS CONCEPTS

• **Human-centered computing → HCI theory, concepts and models**.

KEYWORDS

HCI, unmaking, design, digital fabrication, critical design, making, design methods

1 BACKGROUND

Unmaking refers to the disassembly of an object or structure, or to the dissolution of values, ranks, habits, beliefs, affiliations, and/or knowledge. A growing number of conversations in HCI have emerged around unmaking and related concepts such as elimination [31], uncrafting [29], and de-futuring [15]. Unmaking as a design move has been leveraged in numerous creative ways in art [43], photography [25], education [16], game design [10], 3D physical scanning [28], fabrication [40], repair [22], gadget disassembly [32], and artful

activism [33]. Seminal works in HCI, STS, and design philosophy [1, 8, 13, 18, 41, 46] can be said to epistemologically unmake how we approach design, design research, design contexts, and target users. Unmaking is further used by researchers and philosophers to describe a myriad of phenomena that extend beyond the physical processes of disassembly or destruction, such as striving to dissolve "existing capitalist configurations" [11], destroying one's voice due to physical pain [37], and losing one's sense of home due to unfair housing policies [9] or unneighborly behaviors [4]. Generally, approaches to unmaking in design and HCI can be categorized as follows:

Unmaking as an Inevitable Occurrence: This body of work draws attention to the inevitable obsolescence, disuse, decay, and breakdown of designed things [3, 19, 21]. Scholars here offer critical insights that buildings for example weather [27], age [17], get sick [12], and ultimately die [3], just as markets collapse due to innovation [39] and infrastructures tumble down [20]. They also invite designers to locate creativity and design opportunities in "broken world thinking" rather than normative imperatives such as "novelty, growth, and progress" [19, 27].

Unmaking as a Sustainment Agent: This approach foregrounds the critical (but invisibilized) role of unmaking in design and the sustainment of life. It positions unmaking as part of a "sustainment dialectic" with making, since everything that comes into being (visions, objects, pleasures, and norms) simultaneously destroys (other objects, habitats, resources, or attachments) [14]. Only making is valorized in that dialectic though while unmaking remains "unseen" [14, 38, 45] and goes by "unquestioned, unexamined, unchallenged" [13]. This discourse goes beyond critique, by exploring the centrality of processes such as repair and disassembly to sociotechnical innovation in certain contexts [22, 32].

Unmaking as Elimination for Good: Unmaking through "elimination design" [15] is driven by concerns around harms that occur because the world is inhibited by too many things. This discourse therefore calls for a critical examination to determine if products, objects, and technologies are worth what they harm or destroy, and if so, when, where, how, and for who they should be available [15]. Tonkinwise proposes four strategies to "rid the world of stuff": vilifying with persuasive design, replacing products with others that lead to a consumption reduction, restructuring the environment, and disowning products [42]. Building on elimination design, Pierce proposes "undesigning" for HCI as "the intentional and explicit negation of technology" [31]. Undesigning entails a range of negation strategies such as inhibition (e.g. airplane mode), replacement (e.g. cars with carpooling), and erasure (e.g. removing Wi-Fi from coffee shops) [31]. Unmaking in this discourse has also been leveraged for letting go [36] and dealing with the "aftermath" of design such as plastic and polluted soil [24]. Lastly, HCI researchers have also proposed the unmaking of conventional design approaches that focus on a simplistic problem-plus-solution framing, offering instead "anti-solutionist" approaches that are arguably more fitting for grappling with nuanced issues [2, 5, 6].

Unmaking as Resistance: Numerous designers, artists, and art movements have resorted to unmaking to contest or raise awareness. For example, the series of photographs depicting artist Ai Weiwei dropping a 2,000 year old Han dynasty urn to smash daringly question what constitutes the omnipresent historical, social and cultural values of a thing [43]. The Auto-Destructive Art [26] founded in 1959 by Gustav Metzger brings destruction into public consciousness around war calamities. More recently, the work of artists and activists behind Beautiful Trouble [33] designates sites of unmaking as powerful points of intervention. In HCI, designers have explored the material affordances of computing to propose unmaking certain hegemonic values or complacencies such as surveillance, gentrification, and information over-sharing [7, 23, 35].

Unmaking as Material Innovation: A slew of "un" practices such as unmaking [40], uncrafting [29], and unfabricating [44] heralds a discourse in HCI geared towards novel experimentation with physical objects and materiality. Song and Paulos propose "unmaking" as "the destruction, decay, and deformation — of physical artifacts" [40]. Their formulation posits unmaking as a valuable extension to making, achieved by digitally designing and fabricating objects that unmake in pre-defined ways post-making. Wu and Devendorf [44] similarly develop a pipeline of hardware, material modifications, and digital design tools but for "unfabricating" smart textiles to support sustainable ways to mend, disassemble, and reuse them. Murer et al. propose "uncrafting" as "the thoughtful, reflective process of disassembling … something which could be developed into a practice that – not unlike other studio crafts – requires particular skills, involves specific ways of reflection, and develops and according set of terms and framings" [29]. Uncrafting is geared towards material exposition, inspirations drawn from inherent components, inquiry into the underlying design, and form-function exploration.

The five general design approaches to unmaking showcase a wide range of vital and overlapping applications. For example, a lot of art movements (e.g. Auto-Destructive Art) have resulted in pieces that are a hybrid of unmaking as resistance and as material innovation. Similarly, enabling unmaking in digital fabrication is envisioned to help develop more sustainable materials and considerations. Despite its potential, there exists a set of technical and epistemological challenges for unmaking in HCI which we encountered in our work or found reported in the literature above. For example, unmaking is not necessarily standardizable, generalizable, reproducible, or materially compatible. It is often "deemed to be demotivating, bad news, politically unpopular, negative etc." [14]. And it is laborious but largely defies contemporary interests in commodification, ownership, skill possession, and measures of work. These challenges and pushbacks could limit or even inhibit the wider adoption of unmaking in HCI. Our goal through this workshop is to therefore bring together a cohort of multi-disciplinary experts from HCI, digital fabrication, art, architecture, media studies, STS, and sustainable design to enrich our collective knowledge and body of practice around unmaking and the challenges it faces.

2 WORKSHOP GOALS AND THEMES

Set against a rich backdrop of applications, this workshop will focus on concretizing the material (physical/digital) as well as epistemological (knowledge/frameworks) aspects of unmaking. The current literature, our experience as researchers in making and unmaking, and conversations with other scholars in the field have

helped inform three workshop themes that are potentially crucial to expanding unmaking in HCI:

2.1 Scope

Despite its pervasive role, unmaking is often invisibilized or folded implicitly within making. The objective of the first part of the workshop is to make unmaking explicit by exploring its wide scope of application in HCI practice, research, and theory within the five areas identified above. We will invite participants to share their work on unmaking or showcase how it implicitly pertains to their making-based works. The share-outs of participant submissions will support cross-pollinating ideas, engender collaborations, and help us think through the scope of future unmaking research in HCI.

2.2 Ontology

One of the challenges of unmaking in HCI is the lack of a shared understanding of its ontology and related vocabulary. The HCI literature uses a variety of terms such as unmaking, undesigning, unfabricating, disassembly, destruction, and breaking etc. Further, unmaking is found in decay, breakdown, obsolescence, disaster, and ruin just as in smashing, dismantling, shattering, deleting, smashing, cancelling, discontinuing, burning down, letting-go, and many others. These terms cannot be used carelessly or interchangeably as each codifies a specific form of agency, temporality, and valence. These terms also do not distinguish between unmaking one's own work or someone else's. We will therefore invite workshop participants to develop an unmaking dictionary that describes various sub-processes of unmaking for HCI (both the physical components and the resulting intangible/epistemological components). This glossary of terms can help streamline engagement with unmaking practices in both design and research and build a shared foundation in the field.

2.3 Pragmatics

Scholars have warned that unmaking can have "an unexpected and unwanted aftermath" [24], that it is potentially fractious [30], and not "a universal solution" [24]. These challenges can emerge in unmaking regardless of its application context. The third (and most substantial) part of the workshop will therefore engage participants in discussion about pragmatic aspects of adopting unmaking more widely in HCI. Conversations in this part will run along three threads:

(1) **Tools and Theories:** This thread will focus on the technical tools currently available for unmaking in our field and articulate a wish list of other tools that do not yet exist (or must be adapted from their making counterparts). Further, participants in this thread will generate a list of relevant theories and phenomena that could serve its design and research applications in HCI.

(2) **Design Values and Methods:** Participants will articulate here what design and research frameworks for unmaking could be. They will engage in how common design aspects such as participatory design, stakeholder analysis, design research, and user-centered design can directly apply (or not) to unmaking. The discussion will touch on what new

values or norms are to be ascribed to unmaking, especially when conventional ones such as rigidity, generalizability and endurance may not apply for certain unmaking modalities.

(3) **Politics, Ownership, and Guardrails:** This thread will cover the politics that arise when tinkering with things set within a stable network of norms, orders, and objects likely made by or used by someone else. It will consider object-oriented questions such as who owns the design and who owns its unmaking? What if the designer builds in unmaking options (e.g. time bombs) that subsequent owners do not know about? Who can set or change the course of built-in unmaking? Discussions will also get into the ethical, material, and emotional guardrails that might be needed if unmaking is leveraged widely in HCI, especially in participatory contexts.

3 ORGANIZERS

The organizers of this workshop come from different backgrounds, practice in various design contexts, and are at different academic career stages. They are engaged in research around design, critical theory, and fabrication and some of them have published in HCI on unmaking:

Samar Sabie (primary contact) is a PhD candidate in Information Science at Cornell Tech, working at the intersection of HCI, critical participatory design (CPD), and STS. Her work investigates the role design as a social and material practice plays in the spatial politics of difference in urban contexts. She has also conducted research on shelter customization and permanence in war zones and their constant states of making and unmaking.

Katherine W. Song is a PhD student in Computer Science at UC Berkeley specializing in Human-Computer Interaction (HCI). She develops tangible interfaces and digital fabrication workflows that embrace smart materials and the themes of destruction, slowness, and sustainability.

Tapan Parikh is an Associate Professor of Information Science at Cornell Tech in New York City. His research interests include human-computer interaction and the design and use of information technologies for youth and community development.

Steven J. Jackson is an Associate Professor of Information Science and Science and Technology Studies at Cornell University. His work combines ethnographic, legal and theoretical traditions grounded in pragmatism, critical theory, and post-structuralism with an overall interest in how people build and maintain order, value and meaning in and with the worlds around them. He has written extensively on problems of infrastructure, maintenance, repair, and hope.

Eric Paulos is an Associate Professor in the Electrical Engineering and Computer Science Department at UC Berkeley, and the founder and director of the Hybrid Ecologies Lab. His areas of expertise span unmaking, critical making, urban computing, citizen science, collaborative consumption, robotics, and persuasive technologies.

Kristina Lindström is a Senior Lecturer in design at the School of Arts and Communication at Malmö University in Sweden. Her research spans across participatory and speculative design and feminist technoscience, with a focus on public engagement. She runs the Un/Making Studio with Åsa Ståhl, which explores alternatives

to progressivist and anthropocentric ways of thinking and making within design.

Åsa Ståhl is a senior lecturer in design at Linnaeus University in Sweden and runs the Un/Making Studio with Kristina Lindström. She combines participatory design with feminist technoscience to explore and speculate about making liveable worlds particularly by producing and sharing surplus in and around domestic environments.

Dina Sabie is a PhD candidate in Computer Science at the University of Toronto. Her research explores the potential of design, digital technologies, and co-creative activities in supporting migrants' emotional needs and enhance their relationships with the hosting communities.

Kristina Andersen is an assistant professor at the Future Everyday cluster of the Department of Industrial Design at Eindhoven University of Technology in Sweden. Her work is concerned with how we can imagine futures through digital craftsmanship and collaborations with machines of production and fabrication. This is based on a research interest in human embodied creativity and collaborations with systems, materials, and emerging technologies.

Ron Wakkary is a professor of design in the School of Interactive Arts and Technology, Simon Fraser University in Canada. Wakkary's research investigates the changing nature of design and human-computer interaction in response to new understandings of human-technology relations and posthumanism. He aims to reflectively create new design exemplars, theory, and emergent practices to generously and expansively shape and understand ways of designing that are more accountable, sustainable, and equitable.

4 LINK TO WEBSITE

https://sites.google.com/cornell.edu/unmaking-at-chi is the workshop website. The webpage will be updated with the call for participation, information about attendance, and the workshop agenda.

5 PRE-WORKSHOP PLANS

Our goal is to reach a broad range of audiences who might be interested in unmaking, from junior to established scholars and practitioners, inside and outside the HCI domain. Therefore, we will publicize the workshop and distribute the call for participation via relevant professional mailing lists, social media outlets, as well as personal connections with various research communities (e.g. critical design, 4S, architecture). Participants will be asked to submit contributions (position papers, case studies, design fiction, video, etc.) relevant to the workshop themes. The organizing team will review all submissions in relation to the workshop goals and anticipated discussions. Accepted contributions will be posted on the workshop website as open access before the workshop date. We aim to recruit 20-30 participants.

6 WORKSHOP STRUCTURE

6.1 Pre-workshop documents

Time zone differences and Internet connection issues might inhibit some participants from attending the full workshop. Therefore, we will ask participants to record 3-minute videos of their presentations with closed captions (for accessibility) and send them to us prior to the workshop day. A week before the workshop, we will send

an email to the workshop participants asking them to complete four google documents: (1) A brief statement about the piece they will present in the workshop (2) issues/questions to be discussed in each activity, (3) a short participant profile, and (4) a bibliography of 5 pieces that have informed their thinking about (or interest in) unmaking. These documents will be available before/during/after the workshop for all participants to review and set the ground for a collective discussion during the workshop.

6.2 The workshop day

In this one-day workshop (10:00 to 17:00 EDT), participants will engage in interactive activities focused on the current status and future of unmaking in HCI. The workshop will start with two keynotes speeches by co-organizers to introduce the terrain and showcase two distinct approaches to unmaking in HCI. The first group of participant presentations will follow the keynote speeches. We will then move to Activity 1 in which participants will be grouped (two organizers will facilitate each group) and asked to identify the current practices of unmaking in their work, as well as intersections, and parallels between different forms of unmaking. Moreover, a collective envisioning of a future of unmaking research in HCI will be formed through stories stemming from participants' research. After a long break, we will commence with the second round of participant presentations. Activity 2 is scheduled after, in which participants will cluster again to work together on a dictionary of essential unmaking terms and definitions for HCI. A short break will follow and then the second group of participants will present. In the third (and last activity), participants will choose one of three pragmatic themes to work through and report back. Results from the three activities will be tracked and documented to develop a special issue proposal for ToCHI on unmaking. After each activity, all the workshop attendees will be back in the main room to report on what each group has discussed in their breakout rooms. We will use our institutional Zoom links for the workshop (unless CHI provides an alternative). Digital collaboration tools (e.g., Miro Boards, google docs) will also be used so that each group of participants can document their discussions, interact with others, and provide input. Moreover, a Slack channel will be used as a virtual space to facilitate asynchronous and synchronous communication. Some of the workshop co-organizers already have experience organizing and facilitating in this online format (e.g. CHI '21 migration workshop [34]) and have attended several virtual conferences and workshops.

7 POST-WORKSHOP PLANS

The discussions and outputs of the workshop will be communicated to the broader HCI community via an ACM Interactions article. In the Interactions piece, the organizers will provide a suggested roadmap for the future of unmaking research and design in HCI informed by the workshop activities and discussions. Additionally, the co-organizers plan to hold a call for a special ToCHI issue in collaboration with the participants. After the workshop, a recap of the activities and artifacts will be posted on the workshop website. The website will remain up as a repository of resources for further research and practice in the community. The assembled reading list

Table 1: Workshop Program

Time	Activity
10:00 - 10:20	Welcoming notes
10:20 - 10:50	Keynote speech
10:50 - 11:00	Break and networking
11:00 - 11:40	Participant presentations #1
11:40 - 11:50	Break
11:50 - 12:30	Activity 1: Mapping out the scope of Unmaking in HCI
12:30 - 13:30	Break
13:30 - 14:10	Participant presentations #2
14:10 - 14:50	Activity 2: Co-creating an unmaking dictionary for HCI
14:50 - 15:00	Break
15:00 - 16:00	Activity 3: Pragmatics discussion
16:00 - 17:00	Putting it all together and closing remarks

will be posted there as well to show the different flavors/versions of unmaking that exist in our community.

8   CALL FOR PARTICIPATION: CHI 2022 WORKSHOP ON UNMAKING

Design is conventionally considered to be about making and creating new things. But what about the converse of that process – unmaking that which already exists? Researchers and designers have recently started to explore the concept of "unmaking" to actively think about important design issues like reuse, repair, unintended socio-ecological impacts, as well as novel material experimentation. Despite the increasing attention to unmaking, it remains largely under-investigated and under-theorized in HCI. The objectives of this virtual CHI workshop are therefore to (a) bring together a community of researchers and practitioners who are interested in exploring or showcasing the affordances of unmaking, (b) articulate the material and epistemological scopes of unmaking within HCI, and (c) reflect on the pragmatics and challenges of supporting its wider application in the field. We invite participants from a wide range of disciplines to submit position papers, design fictions, autoethnographic accounts, case-studies, videos, or illustrations of novel methods or theories around unmaking. Submissions will be selected based on quality, contribution to workshop themes, and the potential to stimulate discussions. All submissions must be sent to unmakingatchi@gmail.com by February 24, 2022. Position papers must not exceed six pages (with references) and use the single-column ACM template available at https://chi2022.acm.org/for-authors/presenting/papers/chi-publication-formats/. Notification and reviews will be released by March 10, 2022, the camera-ready and presentation video are due 8 April 2022, and the workshop will be held online on April 15, 2022 (10:00 EDT - 17:00 EDT). Upon acceptance, at least one author must attend the workshop virtually, prepare a recorded video of the presentation with closed captions, and register for both the workshop and for at least one day of the conference. All accepted pieces will be published on the workshop's website. More details are available at: https://sites.google.com/cornell.edu/unmaking-at-chi.

REFERENCES

[1] Jeffrey Bardzell and Shaowen Bardzell. 2013. What is "Critical" About Critical Design?. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. ACM, New York, NY, USA, 3297–3306. https://doi.org/10.1145/2470654.2466451 event-place: Paris, France.

[2] Mark Blythe, Kristina Andersen, Rachel Clarke, and Peter Wright. 2016. Anti-Solutionist Strategies: Seriously Silly Design Fiction. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. Association for Computing Machinery, New York, NY, USA, 4968–4978. https://doi.org/10.1145/2858036.2858482

[3] Stephen Cairns and Jane M. Jacobs. 2014. *Buildings Must Die: A Perverse View of Architecture.* The MIT Press, Cambridge, Massachusetts.

[4] Lynda Cheshire, Hazel Easthope, and Charlotte ten Have. 2021. Unneighbourliness and the Unmaking of Home. *Housing, Theory and Society* 38, 2 (March 2021), 133–151. https://doi.org/10.1080/14036096.2019.1705384

[5] Laura Devendorf, Kristina Andersen, and Aisling Kelliher. 2020. The Fundamental Uncertainties of Mothering: Finding Ways to Honor Endurance, Struggle, and Contradiction. *ACM Transactions on Computer-Human Interaction* 27, 4 (Sept. 2020), 26:1–26:24. https://doi.org/10.1145/3397177

[6] Laura Devendorf, Kristina Andersen, Daniela K. Rosner, Ron Wakkary, and James Pierce. 2019. From HCI to HCI-Amusement: Strategies for Engaging what New Technology Makes Old. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3290605.3300265

[7] Carl DiSalvo. 2012. *Adversarial design.* MIT Press, Cambridge, Massachusetts.

[8] Paul Dourish and Genevieve Bell. 2011. *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing.* MIT Press, Cambridge, MA, USA.

[9] Hazel Easthope. 2014. Making a Rental Property Home. *Housing Studies* 29, 5 (July 2014), 579–596. https://doi.org/10.1080/02673037.2013.873115 Publisher: Routledge _eprint: https://doi.org/10.1080/02673037.2013.873115.

[10] David Eickhoff, Stefanie Mueller, and Patrick Baudisch. 2016. Destructive Games: Creating Value by Destroying Valuable Physical Objects. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. Association for Computing Machinery, New York, NY, USA, 3970–3974. https://doi.org/10.1145/2858036.2858113

[11] Giuseppe Feola. 2019. Degrowth and the Unmaking of Capitalism. *ACME: An International Journal for Critical Geographies* 18, 4 (Sept. 2019), 977–997. https://acme-journal.org/index.php/acme/article/view/1790

[12] Filarete. 1965. *Treatise on architecture: being the treatise by Antonio di Piero Averlino, known as Filarete.* Yale University Press, New Haven. http://newcatalog.library.cornell.edu/catalog/805080.

[13] Tony Fry. 2003. The Voice of Sustainment: An Introduction. *Design Philosophy Papers* 1, 1 (Feb. 2003), 41–48. https://doi.org/10.2752/144871303X13965299301515 Publisher: Routledge _eprint: https://doi.org/10.2752/144871303X13965299301515.

[14] Tony Fry. 2003. Why Philosophy?: The Voice of Sustainment. *Design Philosophy Papers* 1, 2 (April 2003), 83–90. https://doi.org/10.2752/144871303X13965299301713 Publisher: Routledge _eprint: https://doi.org/10.2752/144871303X13965299301713.

[15] Tony Fry. 2008. *Design Futuring: Sustainability, Ethics and New Practice.* Bloomsbury Academic, Oxford ; New York.

[16] Katie Grantham, Deborah Moore-Russo, and Kemper Lewis. 2010. Comparing Physical and Cyber-Enhanced Dissection: An Analysis From Multiple Perspectives. *International Journal of Engineering Education* 16, 6 (Jan. 2010), 1378–1390. https://doi.org/10.1115/DETC2010-28350

[17] Neil Harris. 1999. *Building Lives: Constructing Rites and Passages.* Yale University Press, New Haven.

[18] Lilly Irani, Janet Vertesi, Paul Dourish, Kavita Philip, and Rebecca E. Grinter. 2010. Postcolonial computing: a lens on design and development. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 1311–1320. https://doi.org/10.1145/1753326.1753522

[19] Steven J. Jackson. 2014. Rethinking Repair. In *Media Technologies*, Tarleton Gillespie, Pablo J. Boczkowski, and Kirsten A. Foot (Eds.). The MIT Press, Cambridge, MA, USA, 221–240. https://doi.org/10.7551/mitpress/9780262525374.003.0011

[20] Steven J. Jackson. 2016. Speed, Time, Infrastructure: Temporalities of Breakdown, Maintenance, and Repair. In *The Sociology of Speed: Digital, Organizational, and Social Temporalities*, Judy Wajcman and Nigel Dodd (Eds.). Oxford University Press, Oxford, United Kingdom, 169–186. https://doi.org/10.1093/acprof:oso/9780198782858.003.0012

[21] Steven J. Jackson and Laewoo Kang. 2014. Breakdown, Obsolescence and Reuse: HCI and the Art of Repair. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. ACM, New York, NY, USA, 449–458. https://doi.org/10.1145/2556288.2557332 event-place: Toronto, Ontario, Canada.

[22] Steven J. Jackson, Alex Pompe, and Gabriel Krieshok. 2012. Repair Worlds: Maintenance, Repair, and ICT for Development in Rural Namibia. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work (CSCW '12)*.

ACM, New York, NY, USA, 107–116. https://doi.org/10.1145/2145204.2145224 event-place: Seattle, Washington, USA.

[23] Matthias Korn and Amy Voida. 2015. Creating Friction: Infrastructuring Civic Engagement in Everyday Life. In *Proceedings of The Fifth Decennial Aarhus Conference on Critical Alternatives (CA '15)*. Aarhus University Press, Aarhus, Denmark, 145–156. https://doi.org/10.7146/aahcc.v1i1.21198

[24] Kristina Lindström and Åsa Ståhl. 2020. Un/Making in the Aftermath of Design. In *Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise - Volume 1 (PDC '20)*. Association for Computing Machinery, New York, NY, USA, 12–21. https://doi.org/10.1145/3385010.3385012

[25] Todd Mclellan. 2013. *Things Come Apart: A Teardown Manual For Modern Living*. Thames and Hudson, London ; New York.

[26] Gustav Metzger. 1965. *Auto-destructive art: Metzger at AA*. Destruction/Creation, [London. http://newcatalog.library.cornell.edu/catalog/2053750.

[27] Mohsen Mostafavi and David Leatherbarrow. 1993. *On Weathering: The Life of Buildings in Time* (first edition edition ed.). The MIT Press, Cambridge, Mass.

[28] Stefanie Mueller, Martin Fritzsche, Jan Kossmann, Maximilian Schneider, Jonathan Striebel, and Patrick Baudisch. 2015. Scotty: Relocating Physical Objects Across Distances Using Destructive Scanning, Encryption, and 3D Printing. In *Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '15)*. Association for Computing Machinery, New York, NY, USA, 233–240. https://doi.org/10.1145/2677199.2680547

[29] Martin Murer, Anna Vallgårda, Mattias Jacobsson, and Manfred Tscheligi. 2015. Un-Crafting: Exploring Tangible Practices for Deconstruction in Interactive System Design. In *Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '15)*. Association for Computing Machinery, New York, NY, USA, 469–472. https://doi.org/10.1145/2677199.2683582

[30] Tapan Parikh and Samar Sabie. 2021. On destruction in design. *ACM SIGCAS Computers and Society* 49, 3 (Jan. 2021), 14–15. https://doi.org/10.1145/3447913.3447921

[31] 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)*. Association for Computing Machinery, New York, NY, USA, 957–966. https://doi.org/10.1145/2207676.2208540

[32] Mohammad Rashidujjaman Rifat, Hasan Mahmud Prottoy, and Syed Ishtiaque Ahmed. 2019. The Breaking Hand: Skills, Care, and Sufferings of the Hands of an Electronic Waste Worker in Bangladesh. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3290605.3300253

[33] Joshua Kahn Russell. 2012. Blockade. In *Beautiful Trouble: A Toolbox for Revolution*, Andrew Boyd (Ed.). OR Books, New York, NY, USA, 14–17.

[34] Dina Sabie, Reem Talhouk, Cansu E. Dedeoglu, Carleen Maitland, Volker Wulf, Eiad Yafi, Samar Sabie, Asam Almohamed, Safa'a AbuJarour, Kahina Le Louvier, Faheem Hussain, and Syed Ishtiaque Ahmed. 2021. Migration and Mobility in HCI: Rethinking Boundaries, Methods, and Impact. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems (CHI EA '21)*. Association for Computing Machinery, New York, NY, USA, 1–6. https://doi.org/10.1145/3411763.3441352

[35] Samar Sabie, Steven J. Jackson, Wendy Ju, and Tapan Parikh. 2022. Unmaking as Agonism: Using Participatory Design with Youth to Surface Difference in an Intergenerational Urban Context. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA. https://doi.org/10.1145/3491102.3501930

[36] Corina Sas, Steve Whittaker, and John Zimmerman. 2016. Design for Rituals of Letting Go: An Embodiment Perspective on Disposal Practices Informed by Grief Therapy. *ACM Transactions on Computer-Human Interaction* 23, 4 (Aug. 2016), 21:1–21:37. https://doi.org/10.1145/2926714

[37] Elaine Scarry. 1987. *The Body in Pain: The Making and Unmaking of the World*. Oxford University Press, New York, NY.

[38] Lynda H. Schneekloth. 1998. Uredeemably Utopian: Architecture and Making/Unmaking the World. *Utopian Studies* 9, 1 (1998), 1–25. https://www.jstor.org/stable/20719740 Publisher: Penn State University Press.

[39] Joseph A. Schumpeter. 2008. *Capitalism, Socialism, and Democracy: Third Edition* (3 edition ed.). Harper Perennial Modern Classics, New York.

[40] Katherine W Song and Eric Paulos. 2021. Unmaking: Enabling and Celebrating the Creative Material of Failure, Destruction, Decay, and Deformation. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21)*. Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3411764.3445529

[41] Susan Leigh Star and Karen Ruhleder. 1996. Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. *Information Systems Research* 7, 1 (March 1996), 111–134. https://doi.org/10.1287/isre.7.1.111

[42] Cameron Tonkinwise. 2013. Design Away: Unmaking Things. https://www.academia.edu/3794815/Design_Away_Unmaking_Things

[43] Ai Weiwei. 2018. Dropping a Han dynasty urn 1995. In *Life and dreams: contemporary Chinese photography and media art*, Christopher Phillips and Hung Wu (Eds.). Steidl, Göttingen, 88–91. Meeting Name: Exhibition "Life and dreams:

contemporary Chinese photography and media art" OCLC: 1037895613.

[44] 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 (CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3313831.3376227

[45] Lili Zarzycki. 2021. Revaluing emptiness in Chicago. https://www.architectural-review.com/essays/city-portraits/revaluing-emptiness-in-chicago

[46] 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)*. Association for Computing Machinery, New York, NY, USA, 493–502. https://doi.org/10.1145/1240624.1240704