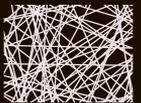


# Anticipatory Repair: Reframing Breakage through a Futures Agenda. Interview with Minna Ruckenstein and Sarah Pink

Interview conducted by  
Melisa Duque and Blanca Callén  
via video call, on November 29, 2023

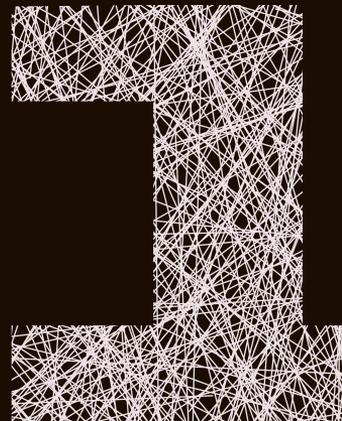
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Interview

 Traducción al español aquí



## Abstract

In this interview, we wanted to explore the notion of repair beyond the usual materialities and temporalities of the present. Therefore, we proposed a conversation between Minna Ruckenstein and Sarah Pink, in order to rethink repair in the digital realm of algorithms, AI, and robotics; as well as to speculate on future breakages, and thus anticipate the kind of repair we might need.

The following pages represent our dialogical reflections about the promises of completeness that underpin technological and innovative design, which are nevertheless continually broken through everyday and organizational practice. We delve into algorithmic and robotic breakages and repairs, and their implications for how we understand the relationship between humans and machines. This leads to critical questions about how STS might contribute to a futures-focused research agenda, and specifically, how it might beneficially account for optimistic and hopeful futures. To advance these questions, Minna and Sarah draw on their extensive trajectories of empirical and conceptual research.

**Minna Ruckenstein** is Professor of Emerging Technologies in Society at the Consumer Society Research Centre at the University of Helsinki, where she directs the Datafied Life Collaboratory. Her current work focuses on human aspects of algorithmic systems, and on the emotional, social, political, and economic realms of emerging technologies. Minna connects anthropology of technology, STS, and media and communication research in her work. She is the author of *The Feel of Algorithms* (University of California Press, 2023); and together with S. Pink, M. Berg, and D. Lupton, a co-editor of *Everyday Automation: Experiencing and Anticipating Emerging Technologies* (Routledge, 2022). Currently, and until 2025, she directs a research project entitled 'REPAIR: Valuable Breakages: Repair and Renewal of Algorithmic Systems'. Together with S. Pink, M. Duque, and R. Willim, they also published 'Broken Data: Conceptualising Data in an Emerging World' (*Big Data & Society*, Vol. 5, Issue 1).

**Sarah Pink** is Professor and Director of the Emerging Technologies Research Lab at Monash University. She is globally recognized as a futures and design anthropologist, and as a methodological innovator. Her most recent works include *Design Ethnography: Research, Responsibilities, and Futures* (co-authored with V. Fors, D. Lanzeni, M. Duque, S. Sumartojo, and Y. Strengers; Routledge, 2022); the monograph 'Emerging Technologies / Life at the Edge of the Future' (Routledge, 2023); and the award-winning design anthropological documentary films *Smart Homes for Seniors* (2021) and *Digital Energy Futures* (2022). In 2023, Sarah was awarded an Australian Research Council Laureate Fellowship, to investigate the impact of future human values and practices on digital and net zero transitions.

*Melisa Duque:* **Could you share an image you have seen, a memory, or an experience of repair that you enjoyed or felt frustrated with?**

*Minna Ruckenstein:* I think Sarah probably has more uplifting repair experiences. I am going to the frustration department. I don't think about a specific technology, but the way algorithmic technologies and AI enter the world as incomplete and unfinished. Some people have talked about how we are in a permanent beta mode with these technologies. They are emerging technologies in the sense that they need to be fitted and implemented in their organizational and human environments. And the frustrating aspect is that they make us all do constant repair work, which can, of course, also be fun and explorative. However, considering the research projects that we have, it is often not fun, since it is extra, unpaid, and unrecognized work. So, it is important to find ways to better identify the tinkering that people do. STS scholars have talked for a long time about how people always tinker with technologies and always find workarounds. But we need to take the care and repair work that goes into living with tech seriously, so that it can also be properly resourced. We don't think about the designs only as technical design, but include the implementation as part of the design process.

*Sarah Pink:* Something similar came to my mind as I immediately thought of the broken promises of tech narratives: the promise of emerging technologies to change the world and fix social problems. Of course, those promises are always broken. The interesting thing is that they get broken by the everyday realities of what people do with technology, but then people repair technologies and create new narratives as well. So, in a sense, it is a different way to express what Minna says: emerging technologies can only be broken if they are conceptualized as complete already. If they are conceptualized as open, they can be developed; if they are conceptualized as complete, they have to be broken, and then people fix them. The example that comes to mind, Melisa, is the one I worked on with you and Juan Salazar about Chilean banknotes (Pink et al., 2019). There, the polymer substrate banknotes come into society and are inevitably broken by people; because they have to be used and get broken. And then, they are repaired by people, which in turn breaks the system that expects them to be complete. And it was so interesting to see how the cycles of completeness, or the myth of completeness, run alongside the narrative of brokenness and repair; and how these two narratives are so intricately connected with each other as well. So, I loved that analysis. The joy in it was actually that process of discovering how those

breakages and repair work together, and how they work in relation to the notion of completeness.

*Melisa:* **And who benefits from the promise of completeness, but also from the promise of brokenness? It makes me wonder how planned obsolescence could be a promise of brokenness that ‘benefits’ things that continue needing repair as an opportunity for product innovation. But as Minna was saying, when the leap between one product that is broken and the next innovation occurs, what happens in between is maintenance unrecognized work... Is there that gap there?**

*Minna:* This immediately brings us into the dynamics of the field. There is something exciting about openness, and the experimentation it implies. But this openness is also frustrating when we actually can't use these technologies as they need to be used. Hence the idea of technologies being convenient and efficient, which is, of course, the tech promise. And then, when technologies cannot fulfill their promises, somebody needs to work with that gap. Gaps are interesting because they can be both very fruitful places and very frustrating ones.

*Melisa:* **[Connection issues begin] We could think about what is happening now (see Figure 1) as both frustrating and enjoyable. But let's move past connectivity issues and return to the questions: Which roles have repair and its family of practices played in your work?**

*Minna:* Our 'REPAIR' project, which looks at breakages and repair, is working in phases. We have mostly looked at breakages so far. And when I talk about algorithmic systems, I am not only referring to technology, but to what Nick Seaver (2019) considers as algorithmic systems: "dynamic arrangements of people and code". So it is always people and code, something in those collaborations coming together that doesn't work the way they should, what creates these breakages. And what we are currently paying attention to is how breakages take place on many different levels, and become visible in many ways.

So, if we focus on repair to think about how different kinds of breakages are being handled, we can think of repair practices as responses to some sort of malfunctioning or shortcomings; but also as inconsistencies in algorithmic systems or AI, so that breakages appear as epistemological breakages. Then, how do we see what the epistemolog-

**Figure 4:** Zoom screenshot of our video interview, showing Minna on the top left; Melisa on the top right holding a phone with Blanca on a video call as a quick fix for the broken internet connection; and Sarah at the bottom with an artwork by artist Victor Luiz on her background wall. Screenshot by Melisa Duque.



ical break is, and how does it come across to cause different kinds of repair work? There is a lot to do in terms of thinking about these kinds of pairings: *what the breakage actually is* and *what kind of repair work it calls for*.

**Sarah:** I agree with that kind of broadness of what we might expect from the concepts of breakage and repair, and how we might want to use them. I keep thinking across all the different projects I have been involved in and how you can very easily shape any of them around a narrative of breakage and repair. For example, by considering ideas of possible completeness, things not being complete, or that they will break when they are supposed to be complete; or that things might need to be fixed somehow, and asking how they will be fixed.

When I ask myself where I see repair in my research, I can see it everywhere. I was looking at some of the materials from my research on automation, robotics, and the construction industry today, an industry in which it is often difficult to even introduce robotics. Robots have potentially been designed—or attempted to be designed—for construction sites, but they are not necessarily being used there. This indicates a breakage in the promise of robotics, since much of the engineering literature suggests that robotics will make work safer in the construction industry, promising that it will prevent workers from being easily injured. We could also use the concept of breakage to consider the structure of the industry, which might need to be reshaped or repaired to enable automated and robotic technologies that would really benefit workers entering the industry. Another place where I have seen repair

in my work is in our ‘Digital Energy Futures’ project. In our research on electric vehicles, one group of participants anticipated that if they had electric vehicles in the future, those electric vehicles were going to break down, would need to be fixed, and there was going to be something wrong with them (Pink et al., 2022). We asked them to imagine their future with electric vehicles, and consider questions about what would happen if the battery breaks while they are driving, the need for an emergency, and some way of fixing these things when they break. Therefore, part of it is *everyday anticipation* that things are going to go wrong and will need to be fixed, which is part of the way we live. Or we need a mode of troubleshooting, that I know you have been working on, Melisa (Duque et al., 2022). It is interesting to think about how concepts such as anticipation, repair, and troubleshooting come down to the ground in everyday life, but can also be larger framing concepts for whole projects.

***Melisa:* And they not only generate relationships, but also very practical economies of care of who is going to provide that service and how is it going to work.**

***Minna:*** One interesting area of the repair work that we are working on in ‘REPAIR’ is around value-led design and law. Here, we treat breakages as violations of shared values or normative order linked to algorithmic scandal cases, that become noticed because they lead to public debate and critical responses, as well as various types of repair activities. One of the cases that we used as an example is the Dutch Child Benefit scandal, which led to various repair efforts in terms of how algorithmic systems are developed. So, in 2019, it was revealed that Dutch tax authorities had used algorithmic modeling to create risk profiles in an effort to spot childcare benefits fraud. Then, a parliamentary report concluded that tax authorities unfairly targeted poor families: they were seen as committing fraud just because they were poor. They were punished for no reason. The consequences were quite harsh politically: the prime minister and his entire cabinet had to step down. Since the scandal, the Netherlands has invested quite a bit in the development of responsible algorithmic practices, and they are thinking of new kinds of checks and balances for developing algorithmic systems in the public sector. In the ‘REPAIR’ project, we are collaborating with Mirko Schäfer from Utrecht University. He is the founder of Data School<sup>1</sup>, and has been developing tools for responsible data practices. We are using one of their tools, called ‘Data Ethics Decision Aid’ (DEDA)<sup>2</sup> in workshops, as a kind of conversational tool to think with. In Sarah’s language, it would be an

1 <https://dataschool.nl/en/>

2 <https://dataschool.nl/en/remote/>

## “the next step is to start asking more questions about anticipatory breakage and repair, and about how we might think about repair and breakage in possible futures”

anticipatory tool that attempts to respond to possible future breakages at the beginning of the project. This is very much what is wanted from regulation, but it just doesn't get to the actual everyday level to necessarily promote anticipatory practices. Therefore, these new realms of repair are quite interesting.

**Sarah:** It invites a new intellectual agenda because there has been so much work on breakage and repair. We commented earlier that questions of breakage and repair have been one of the fundamental pieces of STS work, and they have also been one of the reasons why STS research has been of interest to me. But for me, the next step is to start asking more questions about anticipatory breakage and repair, and about how we might think about repair and breakage in possible futures. So, what are the possible future breakages? What are the possible future modes of repair?

This raises an interesting question regarding whether we really have the ability to break the cycle of the notion of completeness, breakage, and repair. Or do we have to face a reality where there will always be multiple strands of what is called innovation? For instance, in 2050, will we still live with myths about complete things, and the delivery of complete products that impact the world and people's lives? By contrast, as anthropologists, we tend to believe in futures where nothing is ever complete, everything always gets broken, always gets repaired, and moves on in some way.

This means that we need to confront a central question around the agenda for the next piece of research beyond the STS arguments that have served us so well. But for now, I would argue that we need to build on STS work to set a new agenda for the investigation of breakage and repair that has not yet occurred. Methodologically, this raises the question of how to investigate the future possibilities of breakage and repair.

The next question concerns breakdown, which has also been fundamental to STS. Analytically, this is a great proposition, since when things break down, you can see what has gone wrong, and we do need to know what goes wrong and how things go wrong. But what about when things go right? And let us consider not just examples of things that went right already, but also the question of *what could go right*. Instead of what could go wrong, what could go right, which is why I bring up this wonderful book edited by Anna Willow called *Anthropological Optimism*, subtitled *Engaging the Power of What Could Go Right* (Routledge, 2023). However, the interesting thing, then, when you think about breakage and repair, is that you have to ask: How could breakage and repair go right in possible futures? What might we want to break? How do we know in advance what we want to break? Can we anticipate things that we want to break? And can we make sure that we break them well, and that we repair them well? Can we envisage an optimistic pathway into the future, based on the concepts of breakage and repair? Is there a possible future where we can break things with hope, and repair them with trust? Can we frame possible futures of breakage and repair with all kinds of concepts that are positive?

**Minna:** Yes, because if you think about the DEDA tool that we have worked with, it is basically a conversational aid, and it is not really an assessment tool, but a possibility for people who work on data and algorithmic projects to come together and talk. It reminds us that the design of algorithmic services is very demanding, because there are so many things that need to be considered. Thus, there is a whole back-end building, and then there is a front-end building, and there are various kinds of vulnerabilities in the way they are organizationally positioned, and you need to take into account the cybersecurity stuff and all kinds of things. Therefore, we need to think more about the idea of anticipation

**“Is there a possible future where we can break things with hope, and repair them with trust? Can we frame possible futures of breakage and repair with all kinds of concepts that are positive?”**

linked with what the digital is doing. And this can be proactive work. The STS work on repair and breakages is a bit too stable for this type of environment. Algorithmic systems have various short-term consequences, but they also have longer-term consequences, as they often involve the building of whole new infrastructures. So, you have to do that in groups, rather than in a sole design or technology company. The thinking process needs to be more collaborative and dynamic than it currently is.

***Melisa:* I am also hearing in what you are saying, a lot about temporalities: in the anticipatory, in the long term, in the short term; in how technologies are planned to last or not; in how they are imagined for going right or going wrong. It reminds me of Tim Ingold's presentation this past November,<sup>3</sup> when he was talking about how thinking about the future involves an overlap of temporalities, and how the future could be seen in reverse, as if we were trying to design in hindsight to anticipate things to go right. So how can anticipatory repair still be open to everyday design appropriations, without generating more breakages?**

3 <https://vimeo.com/882758212>

***Minna:*** With every new piece of tech that we bring into our lives, it is natural for us to try to fit it better and find workarounds. Then, especially with the patient record system that we are studying, where workarounds take a heavy toll, you have to raise the question of when is the infrastructure so broken, that it actually starts to create another infrastructure not recognized by the official infrastructure. What is the role of repair work and tinkering? This is also a very interesting empirical question. We see different kinds of practices. In the realm of voluntary self-tracking, for instance, most of the repair work was happy repair work, because people were working for themselves, they were finding ways for tech to work for themselves (Kristensen & Ruckenstein, 2018). But then, there are other places where people can't choose the technologies, and they must use technologies that were not self-chosen. In this case, they need to do the tinkering and repair work, even if they don't want to. Therefore, it is very suggestive, also politically. It is important to acknowledge the perspective of repair, because it brings us to big questions about understanding it as a way to make the world more sustainable, and societally more robust. After all, repair is a way to shift attention from the newest shiny technology to what is already there, what has been repaired in a way that works. So, in a funny way, repair is also a call to appreciate repair.

**“repair is a way to shift attention from the newest shiny technology to what is already there, what has been repaired in a way that works. So, in a funny way, repair is also a call to appreciate repair”**

*Melisa:* You mentioned politics, and we have been talking about that with your examples as well. Also, we began with the relationship between care and repair. I have been reading recently about the feminist ethics of care, mostly in nursing and healthcare studies, but it can be a concept that applies to all sectors. What do you think could be the ethics? I know that Sarah thinks a lot through the lens of ethics for technologies. How could ethics play a role in these practices of repair?

*Minna:* I have an ambivalent relationship with care literature because I really like the work, but I also think that this literature is at a bit of a standstill. So, with the work of Puig de la Bellacasa (2011), for instance, we can think of the ethics of care approach as one that makes us look at the neglected aspects of everyday life and maintenance, which is really important. But then I also find that the language of care is somewhat alienating, because it can easily make us think of care as something small and feminine. And this is not what the literature means: feminist scholars have put a lot of effort into saying that it is not small or feminine, not even nice. But we need a new vocabulary to speak about the aspects of care that are so important in this space. I have also written about care, and I use Annemarie Mol's (2008) separation between 'logic of care' and 'logic of choice', because I think that the logic of choice is very tech-logic, as if you could choose and take the most tech and best tech, and it is up to you to be responsible. The logic of care, on the other hand, is asking how we can think about communities of practice. How can we talk about relationalities? So, it is super important. How to repair relationality? When tech is so individualistic, when is that repair needed? People are very drawn to relationalities, but is there a point where tech is so atomizing

and individualizing that social relations start to weaken and be beyond repair?

**Sarah:** I also feel that care is such a fundamental concept, especially when we think about our possible futures, that it needs to be a core value and principle in all the spheres of everyday life, political life, and institutional life. But that, of course, is an expression of care in a very abstract sense, and care is also perhaps a concept that tends to be defined in specific ways by different disciplines, and that is where it starts to become difficult. So, we could say that the dominant narratives—for example, within technology companies or governments and policy—propose caring for the people or the public, which is a very different kind of care to the care that you would experience in everyday life situations, where you are caring for another person in relation to technology. So, one of the things that we found in our research about ‘possible future mobilities’ is that, for instance, people would like to care for their families by driving them to the station. If you drive your partner or your child to the railway station, that is much more caring than putting them in a self-driving car, because you are going with them, and you are delivering them (Pink et al., 2022). So, there is some empirical sense in which there are competing modes of care happening in society, contesting each other’s definition of care and what care can entail.

**“there needs to be more conceptual and empirical unpacking of the question regarding the relationship between care, repair, and breakage”**

And does care mean taking care and not breaking something? Or does care mean repair? Or does it not need to mean either of those things? Perhaps the answer is that there needs to be more conceptual and empirical unpacking of the question regarding the relationship between care, repair, and breakage. And how can that actually be seen in real everyday life in relation to technology? And then, what theories best help us understand what is happening in those situations? This would open up questions about what kind of conceptual and theoretical work could be done in that area.

And then, of course, you can take that into questions about futures. *How do we create futures where care is the key value?* Research from our 'Digital Energy Futures' project tells us that in the future, care will be a key value for our participants as they care for their families, potentially using electric vehicles to transport them to places in moments of extreme weather, or ensuring future air technologies that will filter and purify air in moments in which the air could be contaminated or harmful to their family (Pink et al., 2022). So, in a sense, some of that relates to how future anticipated environmental problems, and the situations or risks people think they might face in those situations, are confronted by imagining technologies that can protect us.

**Minna:** I got stuck with the idea of what might be the relationship between breakage and care that makes us think productively about repair. There are always checks and balances of how to care and what to care for at different moments. So, it might be a breakage from some perspectives, but then it is care from another perspective. And these are the trade-offs, in terms of values, that we constantly do. Then, it is super important in terms of repair that if we repair, we might also be breaking something by promoting some other value. The anticipation of repair has also a value-tension aspect to consider.

**Melisa:** **Because that tension is also seen in designing things to go right, but right for whom?**

**Minna:** Exactly. Sustainability, for instance, is a particularly difficult value because many of our everyday doings are not aligned with the value of sustainability. The way we live, how we heat our homes, how we travel, and how we eat are not necessarily sustainable practices, but we don't want to give them up, because they are also caring practices.

**Sarah:** Yes, these caring practices that are destroying and breaking the world.

**Minna:** That is the paradox. Consumer researchers have tried to show us for decades that our lives are not very sustainable, but still, we don't feel that we are doing something that is breaking the way we are in our own worlds when going about these practices.

**Blanca Callén:** **If the practice of repair, maybe in connection with care—as you have just explained—, and the practice of design—let's say code or technology—were two characters of a vignette, what would they say to each other?**

**Minna:** I think my vignette would say:

The practice of design: “Yes, yes, I understand that some aspects of technologies are not entirely finished when the tech designs land in the real world, or when they say in the AI world that tech lands and operates in ‘the wild.’”

The practice of repair: “Please, do enough rounds of iterations so that your products and services are not half finished, because although I enjoy repair, I don’t want to be the one who does repair work to respond to the obvious gaps and breakages in the design.”

Thus, all kinds of linkages should be thought through carefully enough so that there are no gaps that make the practice of repair too much.

**Sarah:** Well, I guess for me *the practice of repair is the critique of the practice of design*. And if the practice of design remains closed, and it intends to design completed products that it launches into a market, then of course it supposes repair in terms of maintenance, but it doesn’t suppose repair as a more radical alternative. So, *how can you conceptualize repair as part of design, rather than maintenance as part of design?* Because for me, maintenance assumes that something will be maintained in its current form; maintaining is about keeping things as they are. Repair is about mending, it is about fixing. Thus, can repair be more than maintenance? Is repair about restoring something to its current form? Or is repair about enabling it to move onto its possible potentiality? So, this is a very interesting question of how repair and design work together. I am not sure what they would say to each other, but they need to think about their relationship, and they potentially need some therapy.

**Minna:** This resonates with our idea from the ‘REPAIR’ project: that law would be thought of as a form of repair, or regulation would be thought of as a form of repair. We often think about regulation as restricting, but what if you think about it as a productive space of repair? I think that the relationship with regulation becomes much more interesting because many people in tech circles say that ‘regulation kills innovation’. If you think about regulation as an enabling force, then it is actually a potential to proactively design and build something that bears these kinds of anticipatory steps in mind.

**Melisa:** **If we think about the ethnographies of repair, what would you ask a repair practitioner?**

**Minna:** Could I say something that I was thinking is characteristic of AI and algorithmic systems? I think, or perhaps wish, that the more we engage with these systems, the more we start to appreciate things that humans do but have not been a focus of attention. For instance, sensory ways of knowing through smell and touch. Do we start paying attention to some human ways of doing things that have not been of interest to us as much as they should have? Because we have new types of systems that don't do that in such a vicinity of our lives.

**“Do we start paying attention to some human ways of doing things that have not been of interest to us as much as they should have?”**

**Melisa:** **Going back to the last question: because repair is transversal across different practices, what would you be curious to ask a repair practitioner?**

**Minna:** My question would be, *What is the common ground that we share?* I often wonder where design starts and where it ends. What do social scientists know that would benefit designers? And what do designers know that could benefit social scientists?

**Sarah:** I would ask them how they imagine they would go about repairing things in 2050, within the same category of things they repair now.

**Melisa:** **And because, as Sarah was saying before, we are all repair practitioners, how would you answer the questions you just asked? What is the common ground? Or how do you go about repair?**

**Sarah:** I would say that I would very likely go about repairing that thing in the same way in 2050, but the thing itself might not be exactly as it is now: it might be composed of different materials, it might be related to other entities or stakeholders. But my approach to repairing it, the aspects, and how I wish it would be repaired would probably remain the same. Therefore, the values that underpin why and how I would repair it would be constant. Then the idea is to design in such a way

that values can be maintained as we move into possible futures, rather than assuming that we won't need to have values because technology will make the decisions for us.

**Minna:** We find common ground in the appreciation of repair practices and the fundamental human nature of repair practices. One of the things that I have been particularly bothered by lately is that I have been in many conversations where AI developers are treating the human as the problem, because humans are biased, fallible, and inconsistent. I would like to stop this because if we start treating the human as the problem of algorithmic systems, the fundamental question of *who* we are doing this for would basically be like this: Would we like humans to be machines that they could operate in this machine world? Therefore, I would like to have enough common ground as possible to push back these kinds of ideas that basic human qualities become seen as a problem in the coexistence with new machinic agents. □

**“the idea is to design in such a way that values can be maintained as we move into possible futures, rather than assuming that we won't need to have values because technology will make the decisions for us”**

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