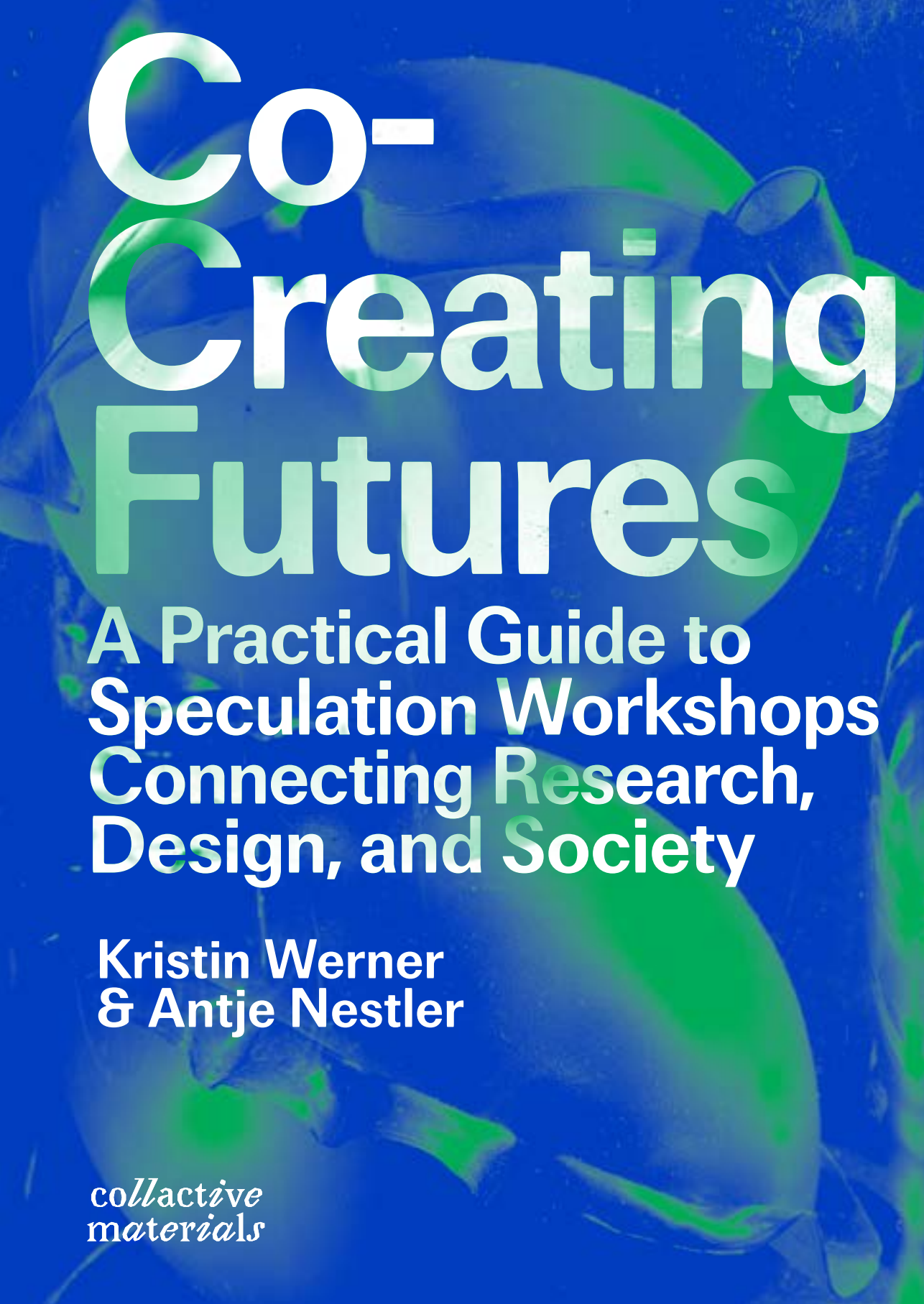

Co-Creating Futures

A Practical Guide to Speculation Workshops Connecting Research, Design, and Society

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collactive materials

How can public engagement foster creative exchange between science and society? *CollActive Materials*, an experimental laboratory for science communication, offers a fresh approach through collaborative speculation. From foundational concepts to practical workshop tools and worksheets, this guide offers tested methods for bringing together academic research, design, and society in co-creating pathways into a sustainable future.

Co-Creating Futures

A Practical Guide to Speculation Workshops Connecting Research, Design, and Society

Content

A digital version of this guidebook with worksheets is available online at: ↗doi.org/10.18452/31342.

Introduction

Speculation – the process of imagining uncertain future outcomes – is a fundamentally human endeavor. Throughout history and at many moments in our lives, we have wondered what the future might hold. We engage in speculation to make decisions, prepare for possible events, and adjust our actions to ensure the best possible outcomes.

The future, however, seems increasingly difficult to imagine. Human-made crises, globalization, and technological developments with far-reaching implications have made our current challenges more and more complex and interconnected.

Research and researchers make an enormous contribution to understanding our world and its difficulties. However, research alone will not be able to find solutions to today's complex problems. The inextricably linked nature of these challenges means that all fields of knowledge must contribute to finding sustainable practices. To achieve this, we need new ways for research and all sectors of society to meaningfully engage in co-creating the future.

With »CollActive Materials«, an experimental laboratory for science communication, we have explored speculation as a method for public engagement.[1] CollActive Materials, funded by the »Berlin University Alliance« and established by the Berlin Clusters of Excellence »Matters of Activity« and »Science of Intelligence«, has invited over 300 participants to engage in creative dialogue through speculation. Running from 2022 to 2025, the project has combined participatory co-creation – inspired by speculative design – with current research content, making it a unique space for public engagement.

In this guidebook, we summarize tried-and-tested methods for co-creative speculation with research. This book is designed for science communicators, public engagement practitioners, public debate initiators, and, of course, researchers who want to co-create and stimulate discussions on possible futures and to find new approaches, ways of thinking, and applications to further their own research. It is our hope that speculation can help identify pressing problems and needs, share concerns and desires, and cultivate new pathways for knowledge exchange between research and society, thereby ultimately paving the way for more sustainable solutions.

1 We understand public engagement as defined by the Berlin School of Public Engagement and Open Science, and Cyber Valley (2023): »Public engagement actively and continuously involves the public in science and brings researchers and citizens into an exchange with each other.« For the purpose of this guidebook, we use ›science communication‹ and ›public engagement‹ interchangeably, while acknowledging that the framework of public engagement aligns best with our vision of engaged research.

In the first chapter, we introduce key concepts underpinning our approach to speculating with research. The second chapter sets out a series of questions that will help you prepare any speculative format from the (initial) ideation stage. The heart of this book is the third chapter, which presents a wide selection of tools for speculation and co-creation, which we have tested in various formats, some of which we highlight in the fourth chapter.

With the preparation tools, workshop methods, worksheets, and sample workshop schedules presented in this guidebook, we hope that we will inspire you to use speculation in your field and find your own speculative practices.

Exchanging knowledge through co-creation: A speculative artifact coming to life as a prototype during the *Visiting Material Futures* workshop series. Photo: Richard Ley

1

Why Speculate with Research?

In this chapter, we introduce key concepts underpinning our approach to speculating with research and its potential for science communication, research, individuals, and societies. At the end of the chapter, you will find case studies illustrating how collaborative speculation can be applied across a broad spectrum of research and design disciplines.

Why Speculate with Research?

Inspired by speculative design

In *Speculative Everything: Design, Fiction, and Social Dreaming* (Dunne and Raby 2013), designers Fiona Raby and Anthony Dunne set out the core ideas of speculative design, which has since established itself as a radically new approach in the field of design. Unlike prevalent forms, which often focus on developing solutions or products, speculative design aims to ask new questions, challenge beliefs, and stimulate critical thinking.

Speculative designers envision different versions of what the future may be like. They present their audiences with artifacts and stories from these imagined worlds. Artifacts are often drawn from everyday life, thus making future scenarios tangible: What products might exist in a world that has been dramatically transformed by technology? What might public spaces look like in alternative societies?

Ultimately, speculative design explores the moral, political, ethical, and social implications of emerging concepts and provides new images of possible futures. It offers emotional access points to future scenarios and engages people in reflection and debate: What kinds of futures do we want to live in? Typically, it is designers who engage in speculative design. In recent years, this process has been opened up via collaborative speculative practices in which multiple actors participate as co-creators.[2] In collaborative (or participatory) speculation, the focus of attention shifts from the individually created speculative design artifacts to the co-creative process of speculation itself.

There is more than one future

A central idea in futures studies, futures thinking, and speculative design is that there is not just one possible future but many. Futures are mental stories that we share. Based on choices, actions, and evolving knowledge and technologies, countless futures are imaginable. This concept is often represented by the »futures cone« (see Figure 1).

Possible, plausible, probable, or preferable?

The futures cone (adapted from Hancock and Bezold 1994) illustrates the potentiality of futures. It takes the form of a cone of light, starting at one point (the present) and widening as it moves forward in time. All the futures inside the cone – all imaginable futures – are so-called ›possible‹ futures. They represent what *might* happen, including events that current research would not (yet) be able to explain. A smaller section of futures are ›plausible‹ – futures that *could* happen, as they make sense based on what we know today. An even smaller section of the cone indicates ›probable‹ futures – *likely* to happen given the state of the present. Finally, a small cross-section of futures are ›preferable‹ – futures that are desirable for the people engaging with them.

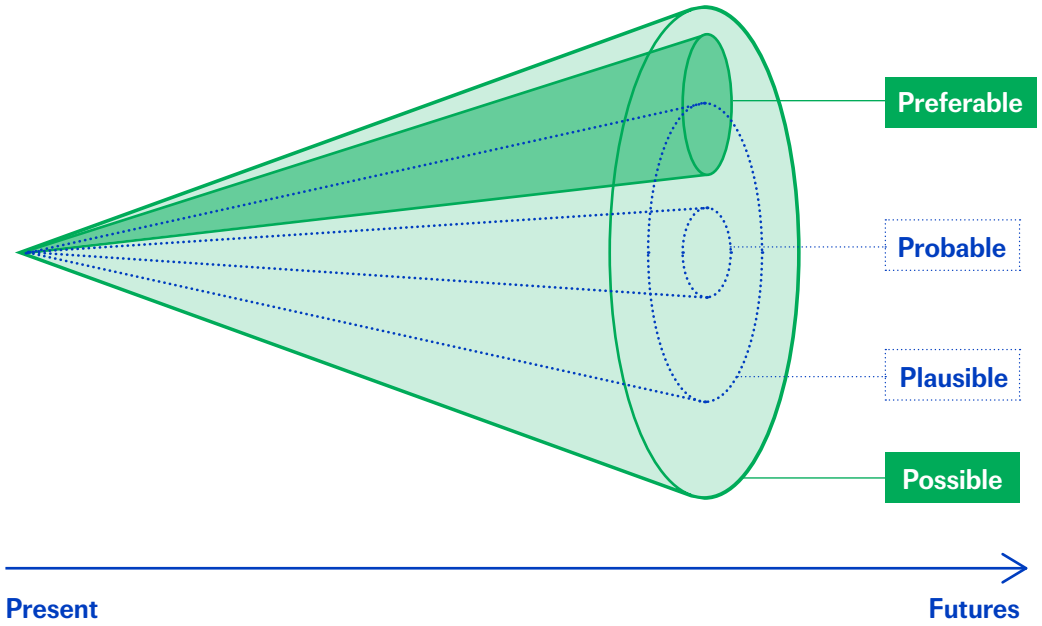

Figure 1: The futures cone, illustrating the plurality and scope of futures. Adapted from Hancock and Bezold (1994)

Our approach to speculating with research

In our approach to using speculation as a mode of transdisciplinary exchange, we focus on *possible* futures. We invite workshop participants to imagine what the future might be like based on, but not strictly limited to, current research findings and questions. Inspired by these ideas, the speculators create artifacts of these futures, which are then shared and discussed. Starting from the sphere of *possible* futures, we thus arrive at questions of *preferable* futures. Ultimately, this approach aims to (i) engage research and society through speculation, (ii) make different possible futures tangible, and (iii) stimulate a debate about which futures are preferable and how to achieve them.

All parts of this process can enrich ongoing research by incorporating the participants' voices, values, needs, and ideas into it, thereby making collaborative speculation a vehicle for multidirectional knowledge exchange. Rather than seeking to solve existing problems directly, collaborative speculation creates a space to explore future possibilities.

Leveling the knowledge playing field

Too often in science communication or public engagement formats, researchers are viewed as experts (sharing knowledge), while members of

2 An overview and categorization of methods in participatory/collaborative speculation is provided in a review by Ye and Zhang (2024); a catalog of methods (in German) has been published by Groß and Mandir (2022).

the public are seen as passive learners (receiving knowledge). Our approach to speculation seeks to challenge this assumed hierarchy. We believe that anyone is an expert if the right questions are asked, especially if those questions are rooted in cultural and everyday experiences. Achieving this requires rethinking the roles of researchers and participants from non-academic contexts in order to promote a more collaborative and non-hierarchical exchange. We explore tools and roles for realizing this in ↗Chapters 3 and 4.

»I found it really exciting to work with different people who have very different backgrounds. It wasn't even directly discussed what kind of backgrounds we had. [...] It was like a collective intelligence, where different people put their heads together and imagined: What could the future look like?«

Workshop Participant

Opportunities for researchers

Collaborative speculation offers unique ways for researchers to engage with stakeholders and publics. Speculation has immense potential not just for sharing factual knowledge, but also for generating awareness, contesting existing beliefs, and questioning the status quo. Furthermore, speculation allows for meaningful engagement that creates space for contradictions and ambiguities – something that is increasingly important in today's complex environments.

Through the future scenarios and artifacts that are created, researchers can gather information to enrich their work, from unfulfilled present needs to individual or shared values that their research touches upon. In addition, speculation has the potential to bring forth unanticipated insights, e.g., to help identify blind spots in research narratives or to find not-yet-made connections through engagement with professional stakeholders or affected individuals and communities. One researcher in our project referred to this as ›serendipity‹ – the unexpected, beneficial discoveries that emerge through these interactions.

»Involving potential future users early in the process fosters a more profound understanding of their needs and perspectives, enriching the design process and building acceptance and ownership of self-sustaining technologies.«

Maxie Schneider,
Researching Architect and Material Designer

Opportunities for speculators

Speculation workshop participants also benefit from this engagement in multiple ways. To speculate about possible futures is to enter a mode of imaginative thinking and exploring that we (at least as adults) rarely allow ourselves to engage in. By exploring scenarios, speculators experience firsthand that the future is not a single path but a range of possibilities and that they have agency in creating preferable futures.

Furthermore, speculation workshops make research accessible. They allow participants to gather information on current research topics and approaches, form opinions, and exchange perspectives in creative ways. For those interested in specific technologies or developments, speculation provides an opportunity to explore and discuss societal implications.

Finally – as we have seen in our workshops – speculation is fun, sparks curiosity, and connects people based on their interests and values.

»My favorite part of speculative design is: We don't refrain from having the craziest ideas. [...] Sometimes we block ideas because they don't seem plausible. And here we don't do that. We actually consider them. And sometimes they are not so crazy at all. They are actually doable.«

Workshop Participant

Societal benefits

Beyond the benefits to individual researchers and those involved in speculation, this approach to engagement offers broader societal benefits. Speculation workshops encourage democratic discourse and actionability by opening up space for debate with a constructive focus. Even outside the context of a workshop, speculation promotes critical thinking and helps to negotiate so-far unchallenged beliefs that are obstacles to more sustainable future practices. Finally, speculation can build resilience and flexibility through creativity, as dealing with uncertainty is rooted in its very core.

By emphasizing diverse lived experiences and values, collaborative speculation fosters empathy and a constructive exchange of ideas. It ensures that research is informed by societal needs and values while providing new ways for speculators to engage in the research process.

»We need research that can make sense of the complexity of this world, and we need curious people who act on the basis of the findings of such research.«

Henning Humml, Futurium Lab
Consultant & Curator

Challenges and irritations

As any form of engagement, speculation comes with specific challenges. Designing questions and speculation prompts that are relevant to everyone involved can be tricky and is best achieved through collaboration between researchers (or other initiators) and experienced engagement practitioners. To help strategically plan and implement the speculation process, we provide a catalog of guiding questions in ↗Chapter 2.

On the speculators' side, creative imagination may be rusty if it is not regularly used. To help mitigate this, facilitators should provide a clear (but not too limiting) framework for speculation. Furthermore, setting expectations is critical when inviting and engaging participants. To prevent confusion or frustration, it should be clear that the goal of speculation is not to find immediate solutions but to explore a topic in a more open-ended way. Tools for creating prompts and facilitating speculation are provided in ↗Chapter 3.

Collaborative speculation case studies

In Figure 2, we present a set of case studies from projects in which topic-based speculations were developed and/or debated in co-creative settings. These examples showcase the versatility of collaborative speculation, which has been applied in diverse fields, from urban planning to emerging technologies.

This set of case studies is neither complete nor selected for best-practice use. Instead, it is intended to serve as a source of inspiration for designing engaging speculation processes. Case studies from CollActive Materials are presented in ↗Chapter 4.

Figure 2: Selected collaborative speculation case studies

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2

Guiding Questions for Designing Collaborative Speculation

To fully realize the potential of collaborative speculation, designing the process well in advance is essential. This includes understanding why you want to speculate and what you ideally want to achieve through speculation, finding themes and questions to speculate about, identifying with whom you want to speculate, and finally, finding the right conditions for all these ideas to flourish and create valuable engagement.

Guiding Questions for Designing Collaborative Speculation

Through many rounds of workshop design, we have found that the best way to prepare for speculation is by using a catalog of guiding questions. Question-based preparation is especially appropriate for speculation, as it is a mindset rather than a fixed set of rules. In this chapter, we share the types of questions that we encourage you to ask yourself when preparing your own speculative project. For further guidance, you will find answers and ideas on how to approach these questions in ↗Chapter 3.

The number and range of the questions reflect the many facets of workshop design. It is not necessary to answer them all at once; in fact, it's not possible to do so. Instead, use this catalog to work through your preparation, addressing some questions at an early stage and others later on. Add to your answers and revise them until they are aligned with each other.

Setting your goals → Why speculate at all?

→ Why do you want to speculate, and why specifically about the topic you have in mind?

→ How would you know that you have reached your goals?

→ In an ideal scenario, who will benefit from this collaborative speculation, and how?

→ How can you obtain feedback and keep learning?

Finding co-speculators → Who to speculate with?

→ Who do you want to speculate with and why?

→ In what ways is the overall topic relevant to the people you want to speculate with?

→ What kind of insights do you want to gain from your co-speculators? Will any workshop participant be able to offer this kind of insight, or is specific expertise needed?

→ Why would people take part in your workshop(s)?

→ How would your co-speculators benefit?

→ What can you offer co-speculators in return for their time, effort, and input? (e.g., monetary compensation, certificates, tokens of appreciation)

Participants mingling during a workshop break. Photo: German Palomeque

→ How can you make the workshop accessible to the people you want to engage? (e.g., workshop length, language, date and time, childcare, physical accessibility)

→ How and where can you reach people to invite them to speculate?

Drawing the playing field → What to speculate about?

→ Which ›What if?‹ questions do you want to explore?

→ What information will your co-speculators need in order to contribute?

→ What kinds of future scenarios are you most interested in: dystopian, utopian, ambiguous, or all of the above?

→ What is the most suitable timeframe for your speculative scenarios? (e.g., 25 years into the future)

Designing speculation → How to speculate?

→ Do you want to create a one-time workshop or a series of activities?

→ If you are planning a series, do you want the same people to speculate over several events, or do you prefer to keep the process open for new people to join? How can you encourage co-speculators to stay engaged in the process?

→ What role(s) should researchers assume during the workshop(s)? Are they co-speculators, facilitators, insight-providers, or are they there for a reality check (in case you want to create plausible futures)?

→ Do you want to involve artists or design professionals at any stage during the process? (See also ↗Chapter 4: Futures of Air & AIRBOUND).

→ How can you document the speculation process and outcomes?

→ What will happen to the outcomes and documentation? (e.g., presented in an exhibition, website gallery, publication, briefings for researchers, ...)

→ Do you need to obtain consent from the participants? If so, how? (e.g., for photo or video documentation, invitations to subsequent events, publication of outcomes or names)

→ If the outcomes are shown publicly, what kinds of author/creator attributions should be made?

→ Which of these questions should be answered by you, and which should be jointly answered with your co-speculators?

→ Do you want to play music during moments of speculation? If so, what kind? Is it royalty-free?

Practical considerations → What else is needed?

→ How can you make it easy for participants to find the venue?

→ What is the most appropriate setup for the workshop room?

→ What materials and tools are needed?

→ What might participants need to feel comfortable during the session(s)? (e.g., breaks at least every 90 minutes, food, drinks)

Experience station at a speculation workshop on air and climate. Several of these stations were conceptualized and facilitated by Prof. Clemens Winkler and the students of the Master's program »Spiel und Objekt« at Ernst Busch University of Theatre Arts Berlin. Photo: German Palomeque

3 Speculative Workshop

Tools

In this chapter, we give you the tools you need to start speculating. Mix and match and see what works best for you!

Worksheets to accompany the speculation methods presented in this chapter can be found online at: ↗doi.org/10.18452/31342

3.1 Getting Started

Tools for creating a welcoming atmosphere, forming speculation groups, and entering a speculative mode of interaction.

Setting the Space

Upon entering, the setup of the workshop space will influence each participant's expectations for the session. Use this opportunity to set the tone for speculation: What images, materials, or objects will participants see as they enter? What music or soundscapes will they encounter?

You can choose to place objects in the workshop space for participants to interact with, e.g., research objects, objects illustrating the theme, or material samples. Or you might choose to display images on the walls to illustrate the topic; these images could be curated by you or sent in by the participants. If you are in contact with the participants before the workshop, you could share a topical question and ask participants to send an image in response (e.g., »What comes to mind when you think about …?«)

What kinds of workshop materials do you want to be visible (e.g., materials for note-taking, sketching, prototyping)? What should not be revealed until the actual start of the workshop?

Workshop participants deliberating in a speculation group. Photo: Felix Noak

Speculation Groups

To prepare for collaborative speculation, we recommend forming groups of three to five co-speculators. With groups of this size, every member is likely to contribute, while group decision-making is still feasible within reasonable time limits.

Self-assembled groups

In short workshops with little time for introductions, consider allowing groups to form organically, with the participants speculating with the people whom they arrived with. Simply set up the workshop space with tables that can accommodate chairs for three to five people. Participants can choose where to sit when they enter, and each table forms a speculation group.

Groups based on name tags

If there is more time for introductions, consider forming groups randomly so that participants encounter unfamiliar perspectives in their interactions with their co-speculators. An elegant method for randomly assigning groups is to use name tags in different colors or with specific symbols; these are given out to participants as they arrive. Later in the workshop, participants with matching tags find each other to form speculation groups.

Groups based on speculation topics

If speculation groups will work on different topics during the workshop, consider allowing participants to choose their group. To do so, label the tables in the workshop space with keywords that broadly describe the speculation topics (e.g., communication, health, mobility, …) and ask participants to choose a keyword when they arrive. Participants then select a topic (and a group) by sitting at the table corresponding to their chosen keyword.

Speculative Introductions

Groups of 3–5
5–10 minutes / For workshops of any length
→ Co-speculators get to know each other by practicing speculation

This method is best used when speculation groups are initially formed. Present participants with a speculative question (e.g.: »What job could you imagine having in 100 years' time?«). Each person introduces themselves to their group by stating their name and giving their speculative answer. By focusing on hypothetical scenarios, speculative introductions avoid reinforcing assumed hierarchies based on current job positions or status. Instead, they create a sense of playfulness and openness, which serves as an ideal starting point for co-creative work.

Co-speculators getting to know each other.
Photo: German Palomeque

Participants arriving in the workshop space across a windy threshold.
Photo: German Palomeque

Mobile workshop setup and group speculation task.
Photo: SCIoI

Theme-Based Introductions

Groups of 3–5
5–15 minutes / For workshops of any length
→ Co-speculators find a personal link to the theme

This method of introduction enables each participant to form a personal connection to the workshop's theme. Invite participants to introduce themselves by stating their names and their answer to a question that directly relates their (everyday) life to the workshop's overall theme. To help participants formulate personal answers in a relatively short period of time, you might present additional questions or a short sample answer.

Example from our workshops:

Introduce yourself to the group by stating your name and describing a personal experience from your daily life in which you were particularly aware of your breathing. Did your breathing become a distraction or did it limit your actions? Did it draw your attention to something in particular? Did you feel a sense of connection through your breath?

Finding personal links to the theme, here on a board during a walk-in format. Photo: SCIoI/Seesaw

Futures Check-In

Individually or in groups of 3–5
3–12 min
→ Participants reflect on personal roles, interests, and values

A ›futures check-in‹ encourages participants to start the workshop with a brief reflection: What perspectives do I bring to the table? What is important to me today? Participants can reflect either individually or jointly in the speculation groups as a way to introduce themselves to each other.

You will find the futures check-in template on the following page and online.* In our version, participants fill in their (first) name, two roles they take on in their daily lives, and then select up to three areas of interest from a list.

Throughout the course of the workshop, ask participants to return to their futures check-in. What was particularly important to them when they entered the workshop? How do their everyday roles reflect the way in which they interact with the world around them? Could this feed into their speculations?

For facilitators, the futures check-in can be a very helpful way to grasp the different perspectives in the room, even if you are not able to follow all individual introductions. To this end, you can invite participants to leave their check-ins out on the table or to share them with the whole group by displaying them on a board.

A simple workshop setup for a speculation group featuring the futures check-in. Photo: Richard Ley

Futures Check-In

My name is _____ .

I am _____

and _____ .

These aspects are important to me today:

[Select up to three]

- ☐ Aesthetics and Good Design
- ☐ Education
- ☐ Energy
- ☐ Freedom and Independence
- ☐ Community and Family
- ☐ Justice, Equality, and Equity
- ☐ Health
- ☐ Industry and Economy
- ☐ Mobility
- ☐ Safety and Security
- ☐ Environment and Climate
- ☐ Living Space
- ☐ _____

3.2 Research Insights

Tried-and-tested approaches for grounding speculations in scientific research.

Research informs and inspires futures, and thus plays an integral role in our speculation process. This second phase of the workshop provides participants with research-backed basic information about the theme and highlights unanswered questions and untapped potential. The aim of this phase is to level the knowledge playing field – to reach a state in which everyone has the information they need to speculate, without placing ›experts‹ on a pedestal. If possible, consider expanding this informative phase by also including perspectives from non-academic contexts.

Three Research Objects

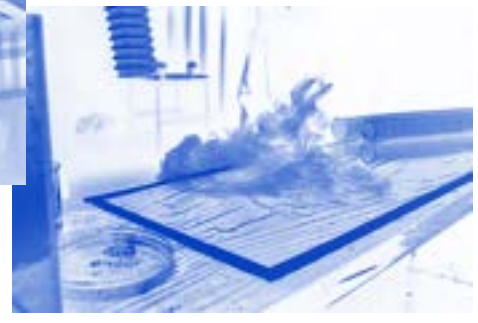
All participants
9–15 min / For short workshops
→ Three researchers present personal research insights

›Three research objects‹ is a storytelling method suitable for workshops with limited time. Each presenting researcher selects an object that is directly or indirectly linked to the workshop theme. This object can represent something they are investigating, something they have learned, something that did not work out, or any other relevant aspect of their research.

Each presenter briefly introduces their object, highlighting how their work ties into the workshop theme and outlining what they are personally interested in exploring.

This method is an excellent way to introduce the theme from the perspective of different disciplines and can be complemented by a Q&A session. As the research insights are often personal and the presented objects relatable, even complex ideas become accessible with this method.

Getting to know robotics research through a soft-robotic hand as an object. Photo: SCIoI/Seesaw



Experience station at a workshop on air and climate. Several of these sensing stations were conceptualized and facilitated by Prof. Clemens Winkler and the students of the Master's program »Spiel und Objekt« at Ernst Busch University of Theatre Arts Berlin. Photo: German Palomeque

Experiments with air-filled pneus by designers Eva Bullermann and Anna Schäffner. Photo: Richard Ley

Research Storytelling

All participants
10 min / For workshops of any length
→ Exploring research through personal stories

Humans are storytellers, constantly connecting experiences and making meaning. Instead of a classic research presentation, try this storytelling format to create a more personal connection between researchers and workshop participants.

Invite one or more researchers to tell a ten-minute story related to their work. Ask them to use minimal or no visual aids, relying primarily on verbal storytelling to put them on a more equal footing with participants. A good research story has personal meaning for the researcher and reveals how they work, why they are researching a particular topic, or what they have learned or unlearned along the way. A research story can be about challenges, unexpected results, new ideas, transformations, failures, hopes, fears, or future potential. Like research itself, the story can be open-ended, starting with one question and ending with another.

Example:

In one of our workshops on breathing, the anthropologist Yoonha Kim shared a story from her fieldwork in Korea, where she engaged with hanbok (Korean clothing) maker Lee Ki-Yeon. Ki-Yeon analysed handwoven cotton fabric and described how the material activity corresponds to the weaver's breath, with its rhythms subtly imprinted in the texture. Though challenging to express in words, by reeling cotton thread and wearing its woven form, the anthropologist came to a sensorial understanding of material as dynamic, embodying and carrying the varied rhythms of ›life‹.

Kristin Werner (left) and Antje Nestler (right) telling material stories during a workshop at Futurium Lab, Berlin. Photo: Richard Ley

Anthropologist Maxime Le Calvé at a hands-on fermentation workshop. Photo: SCIoI/Seesaw

Hands-On Experience

Groups of 3–5
20–90 min / For workshops of any length
→ Activating participants through practical experiences

Hands-on experiences are a unique way to engage participants, boost energy levels, and create connections within the speculation groups. After sharing research insights on a more theoretical level, a hands-on activity lets participants dive into the research topic by touching, making, and experimenting. This embodied way of learning helps to make abstract themes more memorable and gives participants agency before they begin speculating.

Each hands-on activity will be unique to the workshop topic and context. Plan well in advance and consider each step of the experience as you prepare. What kind of activity do you want participants to engage in? What will they be able to take away from it? Will you provide them with step-by-step instructions or give them freedom to experiment? What kinds of materials, tools, and safety equipment will they need?

Consider time management at an early stage in your preparations and choose an activity of an appropriate level of difficulty for participants. We recommend letting participants work together in groups. After providing some initial instructions, it is helpful to give each group individual support.

Examples from our workshops:

→ Exploring experience stations dedicated to sensing air and clouds
→ Creating hydrogels (gel-like polymers) from base ingredients following a step-by-step protocol
→ Sterilizing mushrooms and transferring them to nutrient agar plates to stimulate mycelium growth
→ Designing with heat-sensitive paint

Workshop participants' hands-on experiences, experimenting with hydrogels (top) and preparing mushrooms for mycelium growth (bottom). Captured during the *Visiting Material Futures* workshops at Futurium Lab, Berlin. Photos: Richard Ley

3.3 Speculation

A step-by-step guide to facilitating research-inspired speculations.

This phase is the heart of every speculation workshop. It invites participants to imagine future worlds inspired by research insights and their own experiences, values, and interests. At the end, each group will have created a future scenario and ideally a tangible artifact, represented through sketches and descriptions.

Facilitating Speculation

Below we share a few guidelines to help facilitate speculation. Pick and choose what supports your topic and aims – speculation is a mindset rather than a set of rules.

Speculating, not forecasting

Speculation opens up a space of imagination in which many things are possible. Explain to participants that the aim is not to predict the most likely version of the future, but to imagine different possible scenarios. Likewise, it is not necessary to map out exactly how a new technology (or any other concept) will work. Encourage participants to embrace unknown possibilities in research and societal developments rather than focusing on how feasible their scenarios are or how exactly their imagined technologies would work.

Set a timeframe

Give participants guidance by setting a timeframe. In our workshops, 25 years into the future has proved to be the sweet spot for meaningful speculation. This timeframe is sufficiently far in the future for significant changes to occur while at the same time being close enough for participants to have agency in bringing these changes about.

Encourage individual perspectives

Most meaningful speculations are informed by personal experiences, tastes, emotions, and knowledge – in general, personal ways of looking at the world(s) around us. Encourage participants to bring what they know, think, and feel to the speculation table.

Focus on the everyday

Future transformations become relatable when they are expressed through the lens of everyday experience. Always invite participants to imagine what might change on an individual or family level, or among circles of friends, colleagues, or any other groups in their lives: How would the day-to-day be different in the future scenario?

Find the friction

It is tempting to enter into entirely utopian or dystopian narratives, but the magic of speculation lies in the in-between. Invite participants to get specific and build frictions and ambiguities into their scenarios. How would different people's experiences vary? What values might be in conflict? Is the scenario really as perfect or as strange as it seems?

Use examples with care

One of the fundamental challenges of facilitating speculation is that participants are often uncertain as to what a speculative scenario or artifact might look like. You can use examples to illustrate, but be cautious – examples often stick in the mind and influence final ideas. Try to explain without examples or use a variety of different examples and limit the time that you spend discussing each of them.

Speculation Tasks for Future Scenarios

- Speculation groups of 3–5
- For workshops of any length
- → Participants receive prompts and additional questions to guide their speculation

As a facilitator, your key role is to provide a clear yet flexible structure to guide participants in their speculations. To achieve this, you present them with speculation tasks – concise questions and prompts for each speculation group.

Each speculation task should include:

→ A broad or specific speculation prompt (›What if…?‹). You can give all speculation groups the same (broad) prompt or define a different (specific) prompt for each speculation group.

→ A timeframe, if applicable.

→ Guiding questions to encourage participants to map out the details, especially about the changes in individual and social life that would accompany their future scenario.

If workshop time is short, consider combining questions about a future scenario (›What if…?‹) with questions about an artifact to imagine (see examples on the next page and ↗an artifact from the future).

We recommend giving speculation groups their speculation tasks on printed cards, but other formats (e.g., slides/objects) might be possible as well. These cards act as haptic and visual orientation aids for participants during the workshop. A template speculation card is available in the online resources.

Example of a speculation task, from one of our workshops on robotics:

Imagine a ›Magic Machine‹ or a soft-robotic application that might exist in 2050.
First, think of an area of application (e.g., the home, garden, the care sector, school, agriculture, industry, your own body, ...). Then imagine the characteristics of your Magic Machine.

→What is your Magic Machine like?
→Is it complex or simple?
→How does it move?
→What is it used for?
→Who or what uses the Magic Machine?
→Who is affected by it and how?
→Is it cheap or expensive?
→How long does it last?
→Is it used every day or only on special occasions?
→How do people feel about using it?

Example of a specific speculation task, from one of our workshops on fungal mycelium as a novel material in architecture*:

Imagine a public space that might exist in 25 years' time, inspired by or made of mycelium.
Map out your ideas by writing notes or making sketches.

→How could this space care for the local communities?
→What role does the mycelium network play?
→What size is the space and/or network?
→How does it influence the relationships between humans, animals, plants, fungi, and microorganisms?

*Each speculation group received a different task aimed at exploring different facets of mycelium use in architecture. They were asked to imagine one of the following: a public space / a living space / a ritual or community practice / an anti-pollution intervention / a means of supporting biodiversity.

In both of these examples, the speculation tasks already include a prompt to imagine an →artifact for the future, since workshop time was limited. Further examples for speculation tasks can be found in the case studies section in ↗Chapter 4.

Speculation tasks focus the workshop on the theme, while leaving space for the groups to envision their own future scenario.
Photos: Richard Ley (top), Felix Noak (bottom)

Brainwriting

Speculation groups of 3–5
15–45 min / For workshops of any length
→ Participants speculate – first individually, then together

Brainwriting is a technique that has been developed for idea generation in groups. Unlike brainstorming, in which members of a group share their ideas as they occur to them, brainwriting consists of two phases. First, each group member spends three to five minutes thinking individually about the task at hand, jotting down notes or drawing sketches. After this time has elapsed, everyone shares their idea(s) with the group, which then chooses the most suitable idea to move forward with or combines different ideas into a single proposal.

Brainwriting encourages each individual co-speculator to contribute and helps to amplify quieter voices. The more complex the speculation task or the larger the speculation group, the more time should be allowed for the group discussion.

Participants starting their speculations by brainwriting.
Photo: Felix Noak

A workshop table after a speculation session. Photo: Felix Noak

An Artifact from the Future

- Speculation groups of 3–5
- 15–30 min / For workshops of any length
- → Co-speculators translate their scenario into a specific output

After the speculation groups have identified a future scenario through speculation prompts and brainwriting, invite them to condense their scenario into an artifact. This step of the speculation phase is optional but very worthwhile as a way to explore the implications of a scenario for everyday life.

An artifact is a specific output from a future scenario and can take many forms: an object from this future, a news story, an ad for a service, a job description, an outfit – or any other specific format. The goal of this step is not to physically create the artifact, but rather to design it in the form of sketches and descriptions, ideally as a ↗speculation sketch.

This technique is taken directly from speculative design: Specific artifacts bring future scenarios to life. An everyday object (or any other artifact) makes a speculative future more tangible. Subconsciously, artifacts call upon the imagination: What would it feel like to live in this future?

You can leave it up to the participants to find the kind of artifact that suits their speculation. If time is short, you can give examples or specify a type of artifact in the speculation task.

Co-speculators designing their speculative artifacts.
Photos: SCIoI (left), German Palomeque (right)

Examples from our workshops:

Come up with an object from your future scenario.
→ What is it used for?
→ What is it called?
→ What materials is it made from?
→ Who uses it and why?
→ What emotions does it evoke?

Future service ad:
Think of an ad for a service in your future scenario.
→ Who uses it?
→ Who provides it?
→ Why do people seek this service?
→ Is it free or paid, and if paid, how much does it cost (and in what currency)?

Future news story:
Think of a news story that would be shared in your future scenario.
→ What has occurred?
→ Who was involved?
→ What makes it uniquely relevant?
→ Who communicates it, to whom, and in what format?

Future job:
Draft a job description for a role in your future scenario.
→ What's the job's title?
→ What does a typical workday entail?
→ What challenges arise?
→ Who does this job – and do they enjoy it?

Note: In a capitalist/consumerist logic, artifacts often take the form of everyday products or services that are available in the future. While there is nothing wrong with this, be careful about the kinds of narratives that this may give rise to, especially those surrounding technological solutions. Can a technological product alone fix a problem or a need, or are other transformations required? Can problems or harm caused by technology be repaired by a technological fix?

Speculation Sketch

- Speculation groups of 3–5
- 5–15 min / For workshops of any length
- Speculators sketch out their ideas

In this final stage of the speculation phase, each group puts their ideas for future scenarios or artifacts down on paper. You can use and adapt the speculation sketch template we provide online; on the template, each group enters their (first) names, gives their scenario/artifact a title, draws a sketch, and provides a brief description. Speculation sketches can be shared with other groups in the final phase of the workshop or be used afterward to display the outcomes.

Speculation sketches from a speculation workshop on mycelium use in architecture. Photos: Richard Ley

Speculation Sketch

Co-Speculators' Names: _____

Quick Sketch of Your Idea:

Short Description:

Where is it used? How does it work? What else is important?

_____

_____

Name Your Idea:

_____

3.4 Prototyping

Quick methods for bringing speculations to life.

Prototyping makes speculative ideas tangible. This allows futures to be shared and discussed with all participants – or with a wider audience after the workshop.

Object Prototyping

Speculation groups of 3–5
30–45 min / For workshops of any length
→ Speculators turn their ideas into tangible objects

In this often-used form of prototyping, speculation groups bring their ideas to life in small-scale models or objects that embody the essence of their future scenarios or artifacts.

For this method, provide the workshop participants with various materials and tools (see below). Encourage creativity and remind the groups that the goal is to communicate ideas, not to create perfect objects. Allocate at least 30 minutes to this phase and check in with the groups regularly to help them manage their time.

Given the fragility of many prototypes, consider documenting them with photographs during or immediately after the workshop. If you intend to display or transport the prototypes, bring a sturdy box or container to store them in safely. This is especially important if you are planning an exhibition or future presentations.

Materials and tools

The selection of prototyping materials provided should be diverse but does not need to be extensive – often, fewer options stimulate greater creativity. Keep your workshop goals in mind when selecting materials: Opt for colorful materials for playful prototypes or provide options in limited colors to create a shared aesthetic and maintain the focus on the underlying speculative ideas.

Prototyping in progress during CollActive Materials workshops. Photos: Felix Noak (left), Richard Ley (right)

Base materials in various sizes and qualities
→ Paper and cardboard
→ Cloth, cotton, yarn, thread
→ Wood, e.g., popsicle sticks
→ Air-dry clay or modeling clay
→ Foil, e.g., biodegradable cellulose
→ Waste materials

Specific materials
→ Materials related to the research topic
→ Materials used or created during a ↗hands-on experience
→ Materials with specific functions, e.g., straws, balloons, stickers
→ Materials that stimulate different senses

Binders or other connecting materials
→ Glue
→ Adhesive tape
→ Wire, bare or covered with paper or yarn
→ Sewing kits
→ Stapler

Cutting tools
→ Scissors
→ (Cutting) ruler
→ Cutting knives
→ Cutting mats

Shaping tools
→ Ceramic tools
→ Water bowls to use with clay

Drawing and writing equipment
→ Pens
→ Markers
→ Inks, paint, brushes

Collage Prototyping

Speculation groups of 3–5
10–20 min / For workshops of any length
→ Speculators illustrate their future scenario by producing collages

Collage prototyping is particularly useful for visualizing broader or more abstract future scenarios. It can be used as a stand-alone prototyping method or to complement ↗object prototyping.

Provide participants with large sheets of paper, scissors, glue, pens, markers, and assorted magazines as collage materials. Ask them to use these materials to create a collage as a visual representation of their envisioned future scenario. Remind participants that they probably will not find every image they need, so being creative by combining and adapting materials is key. Encourage them to fill in any gaps in their vision by drawing or using freehand shapes cut from larger images.

Choose magazines that fit the theme of your workshop. Nature, architecture, technology, interior design, and fashion magazines are usually highly suitable. If time is limited, preselect and categorize magazine pages to simplify the process.

Co-created collage prototypes from the *Visiting Material Futures* workshop series. Photos: CollActive Materials

Free Prototyping

Speculation groups of 3–5
45–60 min / For longer workshops
→ Groups choose their own forms of prototyping

In longer workshops, consider allowing speculation groups to decide for themselves what kind of prototype would best fit their speculative ideas. This approach to prototyping can produce unexpected and exceptionally creative prototypes.

Allow enough time for groups to deliberate, decide on their prototyping format, and implement it. In addition to the materials and tools listed under ↗object prototyping and ↗collage prototyping, you may want to provide additional media, such as an instant camera, an instant printer, or a selection of props. Furthermore, you can encourage participants to use the materials that they find around them. Be sure to check in with each group regularly, as greater freedom in this activity may also mean greater need for additional support.

A prompt for free prototyping might look like the following example, taken from one of our workshops on future practices and rituals.

> Give your speculative practice or ritual a material form, e.g., as a performance, an object, a story, or any other form of prototype. Feel free to use the materials provided as you see fit.
> Examples: A step-by-step photographic documentation of your ritual, an everyday scene involving the practice, a future greeting card, a conference presentation, a stop-motion animation …

Co-speculators rehearsing a prototype performance. Photo: Felix Noak

Co-speculators performing a scene to introduce their prototype. Photo: Felix Noak

A prototype displaying a plant that – in the co-speculators' future scenario – has caused genetic mutations. Photo: German Palomeque

Object prototype for the use of tree bark as a dressing material in first aid. Photo: Eva Bullermann

Instant photo story illustrating use cases for a future artifact, co-designed during free prototyping. Photo: Felix Noak

Workshop participants exploring materials during free prototyping. Photo: German Palomeque

3.5 Sharing Futures

Ways for participants to share and debate their ideas with each other.

In this final phase of the workshop, co-speculators present the future scenarios and prototypes that they have developed in their groups. This part of the workshop is essential, as it reveals each group's process, enabling others to gain insights into it, and creates space for reflection and debate.

Future Pitch

All participants
10–20 min / For workshops of any length
→ Each group presents their speculation in a 90-second pitch

The ›future pitch‹ is a simple and effective method that we use in nearly all speculation workshops. Invite all participants to gather around a speculation group's worktable, where one or more members present their prototype(s) and future scenario. Limit each presentation to ninety seconds using a timer – long enough to outline key ideas while maintaining a high energy level. If the groups have been working on different prompts, quickly recap their specific task before the presentation.

After the presentation, invite feedback or comments from the other speculators and presenting researchers. Guide the feedback so that it focuses on the specific characteristics of each scenario rather than its feasibility: What thoughts and feelings does contemplating this future evoke?

Furthermore, to engage the presenting group in a brief reflection on the speculation process itself, you could ask questions such as:
→ How was the speculation process for you?
→ What thoughts and discussions led you to this version of the future?
→ Was there anything in the presented research that inspired you?
→ Why do you think that this particular scenario will play an important role in the future?

Move on to the next table after each round until every group has had a chance to present their scenario and prototype(s).

Participants discussing the implications of each other's speculations. Photo: Felix Noak

Speculative prototype for a bodysuit that helps to sort memories. Photo: Felix Noak

Impromptu Exhibition

All participants
10–20 min / For workshops of any length
→ Bring outcomes together in a fictional exhibition setting

An impromptu exhibition creates a shared context for all speculations. This method is a variation and an extension of the ↗future pitch and brings all presentations together in a fictional setting.

At the beginning of the workshop, introduce the idea of a speculative exhibition that you will all jointly create during the workshop. Present the exhibition with its title, theme, location, (future) date, or even a mock-up poster.

Example from our workshops:

In a workshop on bio-inspired design in research, we introduced participants to a fictional exhibition entitled *Coalescence 2122*. This exhibition, taking place 100 years into the future, would feature everyday future objects inspired by biological patterns, forms, and processes. To give it a unique twist, the exhibition would be staged at the Museum of Natural History in Berlin, where the workshop was held. You can find the complete schedule for this workshop in the case study section in ↗Chapter 4.

During the workshop, speculation groups develop future scenarios and create artifacts for the hypothetical exhibition. These artifacts can be presented as sketches or small prototypes. To structure the process and make the outcomes more accessible, you can provide simple worksheets with prompts for the object's name and its material and purpose.

At the end of the workshop, collect the sketches, prototypes, and information sheets and display them along with the exhibition poster. Afterward, each group can present their ideas in a ↗future pitch.

Boards displaying a workshop's speculative results as an impromptu exhibition.
Photos: Felix Noak (left), SCIoI (right)

Gallery Walk

All participants
10 min / For workshops of any length
→ Participants share their speculations in peer-to-peer conversations

A gallery walk is a dynamic and interactive alternative to the ↗future pitch and can be a great way to end a speculation workshop on a more active note.

Divide each speculation group into two: Ask some members to stay with their scenarios and prototypes to act as presenters. Meanwhile, the other group members can walk around the room and visit representatives of other groups to explore their scenarios and prototypes. After the allocated time for the first round of gallery walks, switch roles and repeat the process.

This exchange allows participants to give feedback, ask questions, and build on the different speculative futures in face-to-face conversations. To ensure that the gallery walk runs smoothly, be sure to set and maintain clear time limits, e.g., five minutes for each interactive round.

Participants visiting each other's workshop tables during a gallery walk. Photo: Felix Noak

Takeaways

All participants
10 min / For workshops of any length
→ Wrap up the workshop with personal observations

After presenting the outcomes, the final part of your workshop will be dedicated to thank-yous, farewells, feedback opportunities, time for networking, and ways to stay in touch. Additionally, a great way to wrap up your speculation workshop is to have the presenting researchers (or anyone who wishes to) share what they will be taking away with them.

4 Case Studies from CollActive Materials

In this chapter, we present three case studies from our project, each of which is unique in its own way. We provide concept overviews and workshop plans as examples. See them not as step-by-step instructions for you to follow, but rather as sketches of experiments that you can refer to when shaping your own.

What is the Future Made of?

(Very) short format | 90 Minutes | Science festival | Interdisciplinary

What is the Future Made Of? A Speculative Workshop on Bio-inspired Design

90-minute workshop
at Berlin Science Week Campus
Museum of Natural History, Berlin, 2022

One of our first speculation events as CollActive Materials was a workshop during *Berlin Science Week*, an annual festival attracting tens of thousands of visitors. This workshop was to serve as a proof of concept for our project: Is it possible for strangers to speculate collaboratively in the short 90-minute time slots during a festival?

Our goals in this first workshop were to test out research-inspired speculation and to gain some initial insights into what collaborative speculation methods could look like. We chose a topic at the intersection of research, design, and everyday life: What might bio-inspired design look like in the future, and how might it impact our lives?

To provide context on the role of bio-inspired design in science and design, we invited three researchers to contribute. Each brought an object from their work and shared their personal perspectives as zoologists, designers, and roboticists.

Building on these insights, we presented participants with a scenario: 100 years from now, a new exhibition entitled *Coalescence 2122* is to open at the Museum of Natural History. This exhibition would showcase future everyday objects created through bio-inspired design. The participants' task was to imagine what these exhibits might look like.

They worked in randomly assigned speculation groups of four, which included the presenting researchers. Each group was given a prompt focusing on different areas of everyday life: living conditions, mind & body, communication, mobility, energy, and food.

> Examples of the specific prompts:
>
> Imagine a new health service or medical device inspired by a relationship between living beings.
>
> Imagine new housing conditions or new ways of living together inspired by natural habitats.

After individual ↗ brainwriting, participants shared their ideas with their group and chose one to continue developing together.

At the end of the workshop, each group presented their envisioned artifact. Displaying all the artifact sketches alongside the mock-up of the speculative exhibit poster highlighted the common themes connecting all future artifacts.

The Cube – a speculative idea for a future human waste recycling project, co-designed by workshop participants.
Photo: SCIol

What did we learn?

Speculation is possible in 90 minutes

While we hoped that it would be, it was still remarkable that such creative collaboration was possible in the limited timeframe and between (perceived) strangers. However, a 90-minute format requires some compromises – either in terms of the research input or the speculation time. In this workshop, we chose short research perspectives; this meant that the resulting speculations did not have a strong link to the scientific background information.

Avoid making presenting researchers co-speculators

Presenting (and later co-speculating) researchers reported that their presence skewed group dynamics in their favor. Participants often sought their approval or guidance and associated them closely with us facilitators.

In later workshops, we have had positive experiences with non-researchers and researchers working together without a hierarchy, provided that the researchers did not present their own work.

Moderators Kristin Werner (left) and Emilia Tikka (right) introducing the speculative approach to workshop participants. Photo: SCIoI/Seesaw

Workshop group discussing their individual ideas and uniting them into one speculation. Photo: SCIoI

90-Minute Speculation Workshop »What Is the Future Made Of?«

Time in min	Aims Why?	Content What?	Method How?
5′	Make participants feel welcome and informed	Welcome, introductions, basic workshop information	Presentation, welcome slide
15′	Share research perspectives to illustrate theme	Introduce the topic from different disciplines: zoology, design, robotics	↗Three research objects
10′	Participants join a speculation group and get to know each other	Form speculation groups, introductions within the groups	↗Randomly assigned groups, ↗speculative introductions
5′	Speculation groups receive speculation prompts	Introduce the speculation and exhibition scenario	Introduction to ↗impromptu exhibition, ↗speculation tasks, presentation with slides
20′	Each speculation group creates a speculative scenario	Participants generate and share ideas in groups; choose an idea to continue developing	↗Brainwriting
20′	Each speculation group develops an everyday object from their future scenario	Brainstorm, sketch, fill out worksheet	↗An artifact from the future, ↗speculation sketch
10′	Groups share their outcomes	Present speculative objects as part of a future exhibition	↗Impromptu exhibition, ↗speculation sketch
5′	Wrap up and stay in touch	Thanks, feedback, exchange contact details, next workshops	Presentation, feedback survey

Futures of Air & AIRBOUND

Workshop series | 8 Hours | Professionally designed prototypes | Public exhibition

8-hour workshops

There's Something in the Air: Stage & Environments

Ernst Busch University of Theatre Arts Berlin, Berlin,
May 2023

From Control to Cooperation: Air as Technology

silent green Kulturquartier, Berlin,
May 2023

Breathing In, Breathing Out: Practices of Air

YOGA at Lobe Block, Berlin,
May 2023

AIRBOUND: Sensing Collective Futures

Public exhibition
Aufbau Haus, Berlin,
October–November 2023

Futures of Air was a series of three independent full-day workshops that invited participants to speculate about air as a social medium. Each workshop focused on a different aspect of air and took place in a unique, thematically relevant location.

One workshop, held at the Ernst Busch University of Theatre Arts Berlin, examined sensory perception and air-themed performances. Another workshop focused on air-related technologies and took place in a cultural community space. The third workshop, which centered on future rituals linked to breathing, was hosted in an open-space yoga studio.

Each workshop had a unique character, which was shaped by the contributing disciplines, including robotics, anthropology, contemporary theater, somatic bodywork, and cultural and media studies. Nevertheless, all three workshops shared a similar structure, and the long time that participants spent together created a remarkably relaxed and intimate atmosphere during all the workshops.

A video documentary of *Futures of Air* and a digital exhibition tour of *AIRBOUND* are available on our website at: ↗collactive-materials.de

Upon arrival, participants chose a specific theme to work on during the day. Speculation groups formed and gradually moved through the various stages of the workshop. With generous time for ↗free prototyping, the speculative outcomes were remarkably more refined than in any of our shorter workshops. They included speculative commercial products with ads, photo user stories, and performances.

And the co-creative process did not stop there: Three designers and artists were invited to attend the workshops as observers. Over the course of a few months after the workshops, they distilled the ideas and thoughts they had witnessed, transforming them into speculative artifacts of their own design.

Later in the year, the three-week exhibition *AIRBOUND: Sensing Collective Futures* showcased these refined artworks alongside a catalog of rapid workshop prototypes and further installations exploring the theme of air. Ultimately, over 600 visitors experienced the exhibition and its extensive program of performances, tours, and discussion workshops.

One of the featured artworks was the spatial video installation *Breathless Choir* by Berlin-based artist Gosia Lehmann. Her work – played on an endless loop – transports us into a future in which clean air has become scarce. We watch four people struggling to breathe and yet connecting through their strenuous efforts to perform a communal singing ritual.

What did we learn?

Co-creation with designers and artists
If you are aiming to craft particularly refined artifacts and compelling storytelling, consider involving designers or professional artists in your speculative process. Make sure that their roles and contributions are clearly defined and well communicated: Is their task to transform the workshop participants' ideas directly into more polished prototypes, or are they free to create their own scenarios, artifacts, and interpretations of the theme?

Time is of the essence: 2030, 2050, or 2100?
The speculative outcomes from this series were wildly imaginative and elaborate, partly because we allowed the participants to choose the timeframe for their speculation. Occasionally, this resulted in speculative outcomes that verged on science fiction. If your goal is to create speculations with a closer link to current realities, consider setting a timeframe, e.g., 25 years into the future.

Speculation and artifacts prompts for the *Futures of Air* series:

New sensory perception:
Imagine a future or alternate world in which air is perceived in a new way through the senses. What is this new sensory perception, and how does it affect individuals and society?

New technology:
Imagine a future technology or application in the field of mobility/energy/communication/health based on ›cooperating‹ with a particular property of air. How would it affect individuals and society?

New breathing ritual:
Imagine a new breathing ritual or practice that reshapes the relationship between humans or between humans and other species. How might it affect society in everyday life?

Sensing air and exploring collective futures – artists, designers, and workshop participants contributed to the public exhibition *AIRBOUND*. Photo: Michelle Mantel

Co-speculators discussing breathing as a cultural practice during a speculative workshop in a yoga space.
Photo: Felix Noak

8-Hour Speculation Workshop »Breathing In, Breathing Out: Practices of Air«

Time in min	Aims Why?	Content What?	Method How?
15′	Make participants feel welcome and valued	Participants arrive, choose topic, receive goodie bags	↗Groups based on speculation topics
15′	Ensure participants have essential information, allow them to settle into the space	Welcome, workshop schedule, team introductions	Team introduces themselves with a movement/stretch for participants to mimic
15′	Participants get to know their co-speculators	Introductions in the speculation groups	↗Theme-based introductions
30′	Participants explore the theme through guided reflection	Artistic input on breath and boundaries	Somatic body practices: meditation and individual movements
15′	Recharge and connect	Break	
45′	Participants create future scenarios	In the context of the group theme, what new purpose might breathing have in the future?	↗Speculation tasks, ↗brainwriting
15′	Enrich scenarios through the lens of research	Breathing as a practice (anthropology/design)	↗Research storytelling
60′	Recharge and connect	Group lunch	
30′	Participants explore theme through guided reflection	Artistic input on breath and community/relationships	Somatic body practices: meditation and group performance
45′	Participants create future artifacts	What new ritual/practice connected to breathing might emerge in your scenario?	↗Speculation tasks, ↗brainwriting
75′	Participants make their ideas tangible	Create artifacts in any shareable form	↗Free prototyping
15′	Recharge and connect	Break	
60′	Share outcomes, give and receive feedback	Groups share their prototypes/performances	↗Future pitch with feedback and reflection
5′	Wrap up and stay in touch	Thanks, feedback, exchange contact details, next workshops	↗Takeaways, feedback survey, thank-you gift

Visiting Material Futures

Workshop series | 3 Hours | Medium length | Public exhibition

3-hour workshops

Smart Materials for Overheated Cities

Futurium Open Lab Evening, Berlin, March 2024

Rethinking Tree Bark

Futurium Open Lab Evening, Berlin, April 2024

Magic Machines Made from Bioplastic

Futurium Open Lab Evening, Berlin, May 2024

Growing Architecture – Co-Designing with Fungi

Futurium Open Lab Evening, Berlin, June 2024

Visiting Material Futures

Public exhibition
Futurium, Berlin, May–August 2024

With *Visiting Material Futures*, we brought CollActive Materials to Futurium, Berlin's ›House of Futures‹. What we wanted to create together quickly became clear: a series of participatory speculative workshops and an accompanying pop-up exhibition.

Our focus was on the role of different active materials in possible futures. What might a future look like in which materials are allowed to change their form, react, and even decompose? Together with researchers from the Cluster of Excellence »Matters of Activity« and Futurium visitors, we explored four themes directly informed by ongoing research. The workshops examined thermally responsive materials for overheated cities, future applications of tree bark, biodegradable materials in soft robotics, and mycelium-based materials in architecture.

Research insights, future scenarios, prototypes, and exhibition photos of *Visiting Material Futures* are available online at: ↗collactive-materials.de.

The three-hour time frame for the workshops proved to be (almost) perfect. With this amount of time, we were able to delve deeper into research topics than in shorter formats while still accommodating participants who could not attend full-day workshops. In an ideal scenario, it would have been great to extend this time by half an hour after the workshop to allow people to stay and mingle.

After the workshops, we documented all prototypes and speculative sketches in a briefing for the participating researchers so that the speculative ideas could in turn feed back into research. The ↗ futures check-in allowed us to present some of the participants' backgrounds in the exhibition, which featured all 24 created future prototypes alongside objects from the research that inspired the speculations.

Due to space limitations in the exhibition, each prototype was represented by a blue figure created from the participants' sketches and collages. Placing one of the figures on a touch-responsive horizontal screen with object tracking revealed more about the scenario's creators and their idea.

Example of an exhibition text accompanying the prototype *Living Forest*:

This speculative idea came about in a workshop group in which a pensioner-gardener, designers, and students came together. Their idea, *Living Forest*, is a new concept for urban planning: In the cities of the future, there could be structures made of thermally active wires that change their shape depending on the temperature. Organic material could be stretched out on the wires and form large leaves above the streets. These leaves could then turn by themselves depending on the position of the sun, providing shade in the overheated city.

What did we learn?

Showcasing co-creation
It is possible to exhibit co-creation workshops! We were able to share both the speculative outcomes from the workshops and insights into the workshop process in the form of photos, sketches, and background information. This experiment was also a new venture for Futurium: Our pop-up exhibition became the first showcase in the Futurium Lab that was co-created with workshop participants.

Interactive prototype for the future scenario *Living Forest*, presented by Henning Humml, Futurium Lab.
Photo: Richard Ley

Visiting Material Futures became the first-ever exhibition at Futurium Lab that was co-created with Futurium visitors. Photo: Michelle Mantel

Exhibition visitors diving into sketches and prototypes of possible futures on a digital touch screen with object tracking. Each figure represents one speculative future as designed in the workshops. Photo: Michelle Mantel

3-Hour Speculation Workshop »Smart Materials for Overheated Cities«

Time in min	Aims Why?	Content What?	Method How?
10′	Make participants feel welcome and informed	Welcome, introductions, basic workshop information	Presentation with welcome slide
15′	Participants engage in personal reflection, get to know their group	Share personal roles and fields of interest/values	↗ Self-assembled groups, ↗ futures check-in
20′	Share insights into research to inform speculations	Researchers provide an introduction to hydrogels and thermo-active paint and wires in architecture	Two 10-minute presentations with slides, material samples
20′	Participants explore material qualities and experiment	Creating hydrogels; working with thermo-active materials	Parallel ↗ hands-on experiences
30′	Each speculation group develops a future architectural application	Brainstorm and sketch	↗ Speculation tasks, ↗ brainwriting, ↗ speculation sketch
15′	Recharge and connect	Break	
40′	Participants make their ideas tangible	Create physical artifacts	↗ Object prototyping, ↗ collage prototyping
15′	Groups share their outcomes	Main ideas, feedback, and reflection on the process	↗ Future pitch with moderated discussion
10′	Link the speculations back to research	How did the researchers experience the workshop?	Interview
5′	Wrap up and stay in touch	Thanks, exchange contact details, next workshops	↗ Presentation, feedback surveys

CollActive Materials

Public Workshops and Exchange Formats

What Is Your Future Made Of?
Pop-up material lab
Mall Anders, Berlin
20-21 May 2022

Ideas Lab: Living Materials
Round table exchange
With Caroline Duncan
Mall Anders, Berlin
20 May 2022

Kombucha Workshop
With Dr. Maxime Le Calvé
Mall Anders, Berlin
21 May 2022

Kids' Lab
With Forschergarten
Mall Anders, Berlin
21 May 2022

What is the Future Made Of?: A Speculative Workshop on Bio-Inspired Design
With Prof. Dr. John Nyakatura, Felix Rasehorn, and Apoorv Vaish
Berlin Science Week Campus
Museum of Natural History, Berlin
5 November 2022

There's Something In the Air: Stage & Environments
Speculation workshop as part of the series *Futures of Air*
With Prof. Clemens Winkler and students of the Master's program »Spiel und Objekt«
Ernst Busch University of Theatre Arts, Berlin
6 May 2023

From Control to Cooperation: Air as Technology
Speculation workshop as part of the series *Futures of Air*
With Prof. Dr. Oliver Brock, Dr. Martin Müller, and Dr. Léa Perraudin
silent green Kulturquartier, Berlin
16 May 2023

Breathing In, Breathing Out: Practices of Air
Speculation workshop as part of the series *Futures of Air*
With Monika Dorniak and Yoonha Kim
YOGA at Lobe Block, Berlin
20 May 2023

Introducing: The Breathless Choir
Speculation workshop
With Gosia Lehmann and Dr. Léa Perraudin
Berlin Science Week Campus
Museum of Natural History, Berlin
4 November 2023

Smart Materials for Overheated Cities
Speculation workshop as part of the series *Visiting Material Futures*
with Maxie Schneider and Bastian Beyer, PhD
Open Lab Evening
Futurium, Berlin
14 March 2024

Rethinking Tree Bark
Speculation workshop as part of the series *Visiting Material Futures*
with Dr. Michaela Eder and Johanna Hehemeyer-Cürten
Open Lab Evening
Futurium, Berlin
11 April 2024

Magic Machines Made from Bioplastic
Speculation workshop as part of the series *Visiting Material Futures*
with Eva Bullermann and Anna Schäffner
Open Lab Evening
Futurium, Berlin
9 May 2024

Growing Architecture: Co-Designing with Fungi
Speculation workshop as part of the series *Visiting Material Futures*
with Dimitra Almpani-Lekka and Natalija Miodragović
Open Lab Evening
Futurium, Berlin
13 June 2024

Growing Architecture: Co-Designingwith Fungi
Speculation workshop
with Dimitra Almpani-Lekka and Natalija Miodragović
HOLITOPIA – Festival for Arts and Futures
Hochschule für Technik und Wirtschaft, Berlin
20 September 2024

Sensing Common Grounds: Towards Collaborative Speculation
Roundtable discussion
With Dr. Camilla Andersson, Prof. Dr. Julia Lohmann, Prof. Dr. Alice Jarry, Prof. Dr. Claudia Mareis
Zentrum für Kulturtechnik, Humboldt-Universität zu Berlin, Berlin
14 November 2024

Exhibitions

AIRBOUND: Sensing Collective Futures
Public exhibition
CLB Berlin at Aufbau Haus, Berlin
October-November 2023

Visiting Material Futures
Public exhibition
Futurium, Berlin
May-August 2024

Upcoming Publications

Speculating With
Open access publication
Dr. Martin Müller and Dr. Léa Perraudin
De Gruyter, Berlin
2025

Sensing Common Grounds: Towards Collaborative Speculation
Open access publication
Dr. Léa Perraudin and Dr. Martin Müller (Eds.)
Spector Books, Leipzig
2025

Image Captions

Front Cover: Balloon samples made from biodegradable cellulose, developed by textile designer Eva Bullermann. Photo: Michelle Mantel

Inside Front Cover: Speculation sketch and bubble prototype, co-created during a workshop on soft robotics and magic machines. Photo: Richard Ley

Page 6/7: Experience station at a workshop on air and climate. Several of these stations were conceptualized and facilitated by Prof. Clemens Winkler and the students of the Master's program »Spiel und Objekt« at Ernst Busch University of Theatre Arts Berlin. Photo: German Palomeque

Page 14/15: Collage prototype, co-designed during a workshop on material futures. Photo: CollActive Materials

Page 20/21: Collage prototype, co-designed during a workshop on material futures. Photo: CollActive Materials

Page 22: Several material samples of degradable and non-degradable plastics, at a workshop on material futures. Photo: Richard Ley

Page 28: Workshop participants during a hands-on experience at Futurium Lab. Photo: Richard Ley

Page 34: Speculative designer Emilia Tikka consulting a workshop group during their speculation process. Photo: Felix Noak

Page 44: Prototyping with pine bark, the research object itself. Photo: Richard Ley

Page 52: Workshop participants sharing their speculative ideas with each other. Photo: Felix Noak

Page 58/59: Collective performance *AIRNSHARE #2* by artist Doris Dziersk, during the closing night of the exhibition *AIRBOUND*. Photo: Felix Noak

Page 74: Workshop participants prototyping with air-drying clay and hydrogels. Photo: Richard Ley

Inside Back Cover: Prototype of a novel material combining hydrogel and solar fibers, co-created during a workshop on climate-adaptive architecture. Photo: Richard Ley

Back Cover: Prototype of a hydrogel brick for sustainable flood prevention, co-created during a workshop on climate-adaptive architecture. Photo: Richard Ley

Imprint

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Over the course of our project, about 300 workshop participants have shared their ideas and speculations with us. We acknowledge every single person's contribution – without them, this project would not have been possible. Thank you!

Realized by:

Matters of Activity Image Space Material

science of intelligence

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Bundesministerium für Bildung und Forschung

About Us

Dr. Kristin Werner is a science communicator and public engagement professional. Drawing on her background as a natural scientist, Kristin is dedicated to finding new forms of meaningful knowledge exchange between research, art, applied expertise, and civil society. As the coordinator of CollActive Materials, Kristin has overseen the project's strategic direction, designed and facilitated speculative workshops, managed exhibitions, and has shared the project's speculative approaches with transdisciplinary researchers and the growing community of public engagement practitioners.

Antje Nestler is a science communicator within the Cluster of Excellence »Matters of Activity« and a Principal Investigator for CollActive Materials. With a background in communication and language studies and knowledge transfer through scientific exhibitions, Antje tests experimental formats for public engagement. Within Matters of Activity, she played a key role in setting up the Cluster's showroom, the *Activarium*, where visitors can experience prototypes of its interdisciplinary research on active materials such as bark, biofilms, and mycelium. In addition, Antje works as a freelance science communicator, sharing research insights and sparking conversations about what the future holds.

CollActive Materials (2022–2025) is an experimental laboratory in the Berlin Clusters of Excellence »Matters of Activity« (Humboldt-Universität zu Berlin) and »Science of Intelligence« (Technische Universität Berlin). The project, which is funded by the »Berlin University Alliance«, aims to develop speculative design as a new approach to knowledge exchange between researchers, designers, and society at large. As an experimental transdisciplinary project, CollActive Materials establishes an open conversation between everyday material practices in diverse social contexts and various approaches in research. This collaborative mode sparks joint discussions and imaginative explorations in order to envision collective material futures.