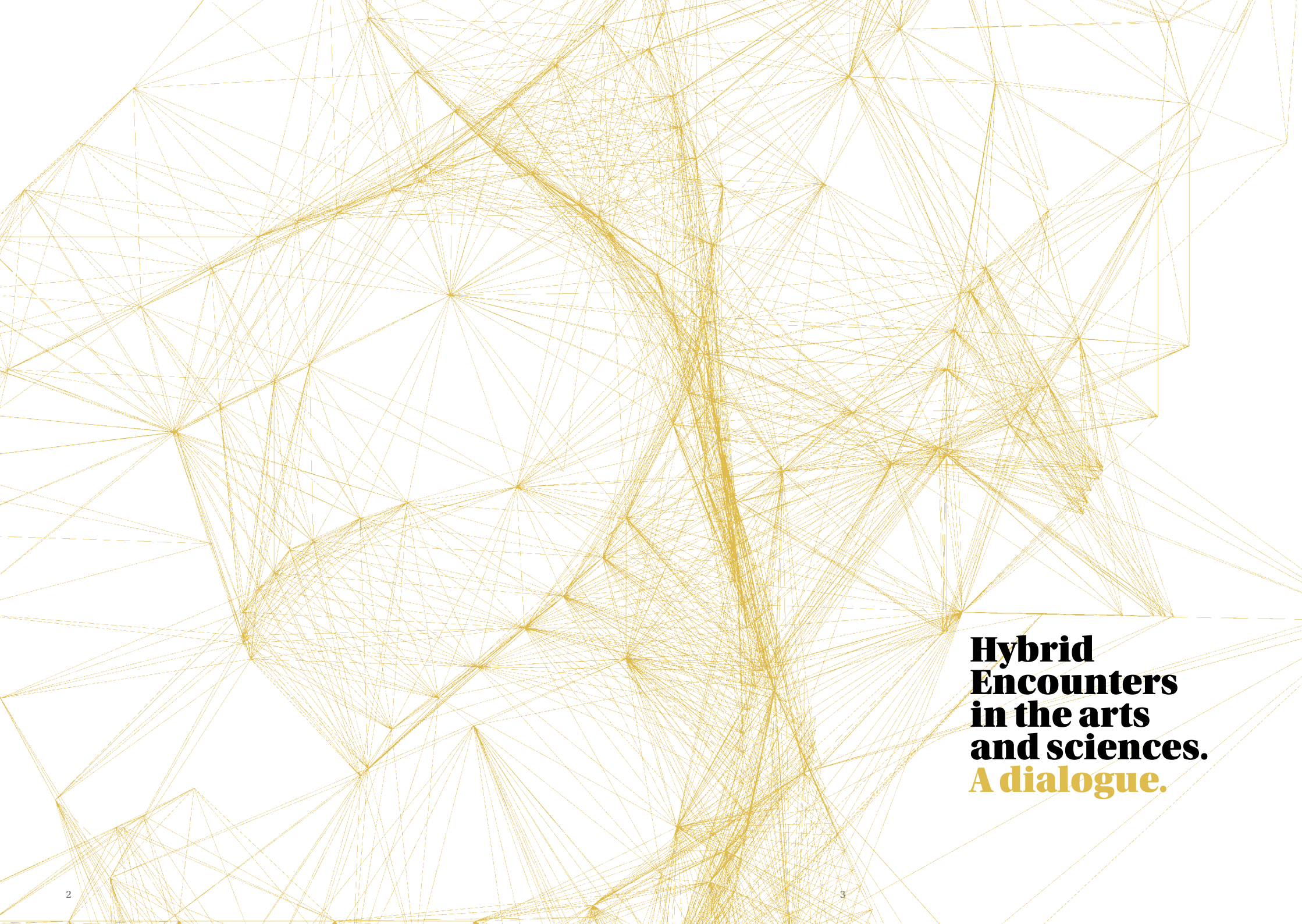




**Hybrid
Encounters
in the arts
and sciences.
A dialogue.**



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Introduction

The dialogue between disciplines, between the arts and sciences, is at the heart of the *Hybrid Encounters*. The events in this series highlight the growing interest in the exchange, development and use of collaborative forms of (creative) knowledge production and knowledge processes.

During the encounters transfer processes could be observed that went beyond a mere absorption of the respective resources. The speakers explored how the possibilities of confrontation and the challenges of understanding can give rise to new questions and unexpected ideas. Focus was placed less on the familiar than on the emergence of new knowledge – both in the arts and in the sciences. This publication, which marks the end of the *Hybrid Encounters* series, presents the current discourse on the potentials and challenges of cooperative projects between the arts and sciences, placing them in the context of institutions and educational systems.

The *Hybrid Encounters* programme focused on four events for which eminent international guests from the arts and sciences were given a *carte blanche* to invite a personality from an artistic or scientific field who sparked their interest. Together these individuals provided insight into their ways of thinking and working and into the realms of artistic ideas and scientific approaches, while exploring similarities and differences. They revealed how an active exchange or even a dual approach can open up new areas of knowledge and benefit both the artistically and scientifically creative mind.

Questions related to the interaction of the body and brain, embodied knowledge and the emotional effects of neuronal functions were central to the encounter between British dancer and choreographer Siobhan Davies and neurologist Arno Villringer. The performance *Figuring* by Siobhan Davies and Helka Kaski presented dance as a gestural language. This choreography led to a conversation on the difference between rehearsed, goal-oriented movements and more intuitive, emotional movements, which have so far received little attention in neurological investigations of motor functions.

The live DJ set of Westbam, one of Germany's most famous DJs, gave the literary theorist Hans Ulrich Gumbrecht a glimpse into a whole new world. After Gumbrecht was introduced to the art of mixing beats, their conversation led to musings on what 'mood' means for their respective disciplines and how it can be influenced or musically or intellectually reflected.

The Argentinean artist Tomás Saraceno was keen to learn as much as possible about bionics and biorobotics. True to his interconnected way of thinking and working, it was Saraceno's wish not to design the encounter as a one-on-one dialogue, but to instigate a brainstorming session with various experts. For this reason he invited Ingo Rechenberg, co-creator of evolutionary biological algorithms in the engineering sciences, Benjamin Wild from the BioRobotics Lab, and Alex Jordan, who focuses on hierarchical social systems in human and animal societies and the digital system, to join him. In the course of the conversation the question was raised as to whether and how artificial intelligence and machine learning will render the distinction between nature and culture obsolete. The dialogue was complemented by a so-called *Arachnid Jam Session* in which the musician David Rothenberg performed with a spider provided by Tomás Saraceno's studio.

Her love of literature led neuroscientist and expert on memory formation in the brain, Hannah Monyer, to the subject of her doctoral thesis *Phenomenology of jealousy in the work of Marcel Proust and the psychiatric literature of his time*. Going one step further, we matched her not with an author of the traditional kind but with Jens Harder, who creates narratives and stories through pictures, i.e. comics. Together they explored the difference between acquiring knowledge by reading texts and by viewing illustrated stories, and how this can influence memory formation.

On the following pages we invite you to reflect on what is needed to successfully bring together art and science. In an inspiring conversation four experts in cross-disciplinary collaborations give insights into the experiences that they have accumulated in the course of their work in cultural organisations, museums, universities and various research bodies in Germany and all over the world. They share with us the pitfalls and opportunities that such exchanges provide. Enjoy this conversation about art and science, about the thrill of the exchange between disciplines, the challenges of collaboration and the surprises that always occur when different fields and their representatives are brought together.

Speakers



Bergit Arends (BA) is a curator and researcher, creating and studying interdisciplinary curatorial and artistic processes with a current focus on environment and visual art. Most recently she was in Collection Care Research at Tate and is now British Academy Post-Doctoral Research Fellow at the University of Bristol. She has published works on such subjects as plants in artistic practices (Jovis, forthcoming) and *Contemporary Art, Archives and Environmental Change in the Age of the Anthropocene* (2017). Bergit Arends has curated a variety of contemporary art projects for natural history museums in London and Berlin.



Ken Arnold (KA) is both Head of Public Programmes at Wellcome Collection London and Creative Director at Medical Museion, an innovative museum and research unit at the University of Copenhagen. He has been staging critically acclaimed exhibitions and events for over 20 years. Throughout his career he has explored the connections between medicine, art and life and helped foster new and collaborative dialogues in the fields of art and science. With his work Ken Arnold seeks to facilitate unexpected improvisations and unintended consequences in collaborative work between the realms of art and science.



Berit Greinke (BG) is junior professor in Wearable Computing at Berlin University of the Arts and Einstein Center Digital Future (Berlin). She utilises a multi-disciplinary approach with a research focus on artistic practice and engineering techniques for electronic textiles and smart materials, combining crafts with novel manufacturing technologies. Berit Greinke's work has been supported by such institutions as the Engineering and Physical Sciences Research Council (UK), Medical Research Council (UK), Leverhulme Trust and DAAD.



Jens Hauser (JH) is a Paris and Copenhagen based media studies scholar and art curator focusing on the interactions between art and technology. He has worked with the University of Copenhagen's Medical Museion as well as at the Department of Art and Cultural Studies, the École Polytechnique Paris-Saclay and the Michigan State University on the topic of art-science collaborations. Recent exhibitions and festivals include *MATTER/S matter/s* (Lansing 2018), *Applied Microperformativity* (Vienna 2018), *UN/GREEN* (Riga, 2019), and *OU \ / ERT* (Bourges, 2019-20).

Compared to the 1960s and afterwards, when art and science were treated as separate worlds, what has changed and where do we stand now?

BA: In the 1990s the two cultures¹ debate was such a prominent point of reference. Everybody always emphasised that we have to go beyond it. I think this has changed significantly today, hasn't it? It is not assumed any longer that art and science are two cultures that have nothing to say to each other. It is incredibly difficult to trace the contemporary history of art and science collaborations. Which institutions are collecting these projects? How are they and the processes they involved being documented, particularly since a lot of the really interesting information is found in these processes? The places where this type of work took and takes place are now myriad. It has become incredibly complex to track and research the history of this multi-disciplinary approach.

KA: That's correct. I do believe, however, that C. P. Snow's claim that art and science are binaries should constantly be remembered and discussed. It's essential that this schism be rethought and rediscovered. Bergit, you and I, we were involved in the early 1990s with this great idea of 'Why don't we get an artist and a scientist to come together and do something?' After two decades of support for such projects, funding for these sorts of art-science collaborations has significantly decreased and even disappeared. Organisations change of course, but my hope is that funding for more exploratory artistic projects in the realm of science will be supported again in the future.

BA: On the other hand this shows that art-science collaborations did receive funding and curatorial support from institutions ...

KA: The point of bringing together art and science is that collaborations like these are always potentially interesting, surprising even, and should for the most part not pay attention to what has happened before. Almost deliberately reinventing the wheel with unexpected turns. If we take Jens's project about greenness for example ...

JH: ... Well, in my opinion the potential of 'greenness studies',² which I have now been pursuing for some years, is that the trope of 'green' appeals very intuitively to many areas and disciplines that may seem unrelated at first. It works as a Trojan horse, camouflaging a huge reservoir of interdisciplinary agents that are set free on the marketplace of ideas. It then slowly disperses into such research

1. "The Two Cultures" was an influential lecture held in 1959 by Charles Percy Snow. Snow's main thesis was that the intellectual life of western society was split into two cultures - the sciences and the humanities. Snow's thesis sparked heavy controversy and resulted in the book *The Two Cultures and the Scientific Revolution* (New York: Cambridge University Press, 1959), which was widely read on both sides of the Atlantic. In the 1990s the discussion flared up again. At this time the concept of 'the third culture' was the focus. It was not the differences but the common ground of art and science that were promoted and discussed.

2. Greenness studies initiated at the University of Copenhagen under the label *OU\ /ERT* have given rise to such conferences as the *GREEN* conference organized by the Society for Literature, Science and the Arts in 2018, the exhibitions *UN/GREEN* at the Latvian National Museum of Art in Riga and *OU\ /ERT* at the Transpalette Art Centre in Bourges, as well as to the transnational EU Creative Europe project *GREEN (Green Revisited: Exploring Emerging Nature Cultures, 2019-2022)*.

areas as colour theory, perception, phenomenology, physiology, sociology or even very specialised research into the toxicity of green pigments, to name a just few. In the end such conferences or exhibitions consist of little niches of knowledge production which, under one overriding term, produce many totally unexpected linkages. It serves as a platform for disciplines that would otherwise never coalesce.

KA: So if that project really did say all there was to say about greenness, then we would end up thinking there's nothing interesting left to explore. I would much rather know now, then forget a little, and then rediscover the topic and insights again, rather than feel as though lessons have somehow been learned for a long duration. Maybe I'm more interested in gaining understanding than having knowledge.

BG: Absolutely. I think that it's exactly the non-definition of art and science projects that makes them interesting. I mean, what is it that we want? Do we want nothing more than to create a great collaboration? Do we want artists and scientists to like each other? Do we want them to be able to work together? Do we want them to make a product or an artwork? The positive thing is that we haven't settled on the question yet, which I think is a really interesting point because it allows us to come up with new questions all the time.

KA: What's the core question for you?

BG: I'm really interested in negotiating collaborations, in the communication processes between artists and scientists. This might be due to my own experience as a practitioner and my interest in finding ways to inspire one another. I have come to understand that the processes we go through are often not that different. What we need, however, are ways to make similarities tangible. Understanding that even though there's a clash in the beginning, it will probably lead somewhere over time and result in a situation that allows for collaboration and exchange.

BA: There are two key strands of thinking related to this: the work on contributorship, i.e. to understand in detail who participates in multidisciplinary projects and how the respective contributions are acknowledged and given credibility - everybody counts. Incidentally, the research on contributorship comes from the medical sciences, but also from participatory and social artistic practices. Secondly, disciplines now collect around specific topics, such as environmental issues, to which there is an urgency and

which require multiple kinds of expertise to advance. Hence, practices now go way beyond the art and science binary.

JH: Art-science collaborations are what I like to call fruitful misunderstandings. Very often there are different expectations in working processes that generate a creative tension. This is due to an asymmetric relationship between the individuals involved, no matter what discipline they come from. Some fundamental questions are usually raised, like: What is science? and: Why is it that only the natural sciences, or let's say empirical research, are very often considered 'true sciences'? What about the status of the *Geisteswissenschaften*, a term coined by Wilhelm Dilthey³ with the intention of making it possible for research in the humanities to be carried out along the lines of the natural sciences? To go even further: Why are the arts so often primarily associated with the humanities, and not with engineering, while especially in the media arts so many practitioners have a background or a focused interest in the natural sciences, or at least advanced technical expertise? My suggestion to overcome this binary thinking is to look at art and science as two different modes of investigating the world, which however become increasingly related due to their shared tools, apparatuses and media. In this context I would claim that we are facing an 'epistemological turn' today. Just as Hans-Jörg Rheinberger's⁴ concept of 'epistemic things' was devised to describe not only the tools and agencies used in scientific research, e.g. model organisms, but also the special dynamics of research processes – which Rheinberger references with respect to life sciences. I think that looking at the epistemological side of art-science collaborations makes a lot of sense today: while the technosciences have themselves become powerful producers of aestheticised images, art is no longer merely concerned with the aesthetic transposition of knowledge, but of knowing and feeling how knowledge is being produced as well.

BA: I think what we have been touching on shows an overall trend to think in a more interdisciplinary way. You can look at the medical profession for example or the sciences in general: collaboration is at their heart. Take CERN⁵ for example, where the data analysis is geographically and institutionally distributed and carried out by many analysts. I think of interdisciplinarity as a general paradigm which we can't just claim for art and science. This has changed the practice of science in addition to how expert cultures talk to and inform one another. Binary thinking is challenged not only in the realms of art and science but also in other fields, such as medicine or conservation science, creating interesting practical uses and new

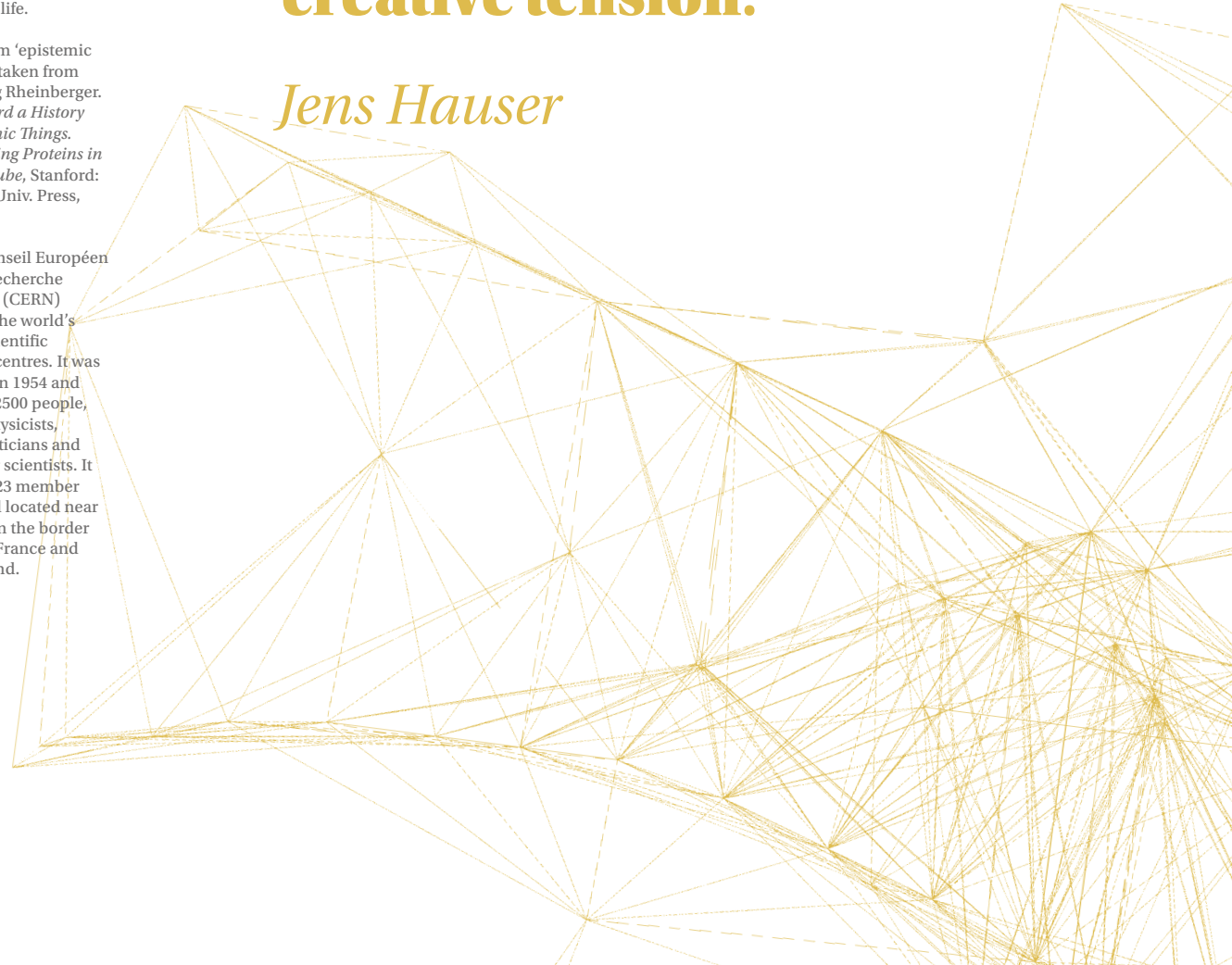
3. Wilhelm Dilthey (1833-1911) was a German philosopher best known for his distinction between the natural and human sciences, which can be summarised as follows: while the main task of the natural sciences is to arrive at law-based causal explanations, the core task of the human sciences is the understanding of the organisational structures of human and historical life.

4. The term 'epistemic things' is taken from Hans-Jörg Rheinberger. See *Toward a History of Epistemic Things. Synthesizing Proteins in the Test Tube*, Stanford: Stanford Univ. Press, 1997.

5. The Conseil Européen pour la Recherche Nucléaire (CERN) is one of the world's largest scientific research centres. It was founded in 1954 and employs 2500 people, mostly physicists, mathematicians and computer scientists. It is run by 23 member states and located near Geneva on the border between France and Switzerland.

“Art-science collaborations are what I like to call fruitful misunderstandings. Very often there are different expectations in working processes that generate a creative tension.”

Jens Hauser



“Binary thinking is challenged not only in the realms of art and science but also in other fields, such as medicine or conservation science, creating interesting practical uses and new academic disciplines.”

Bergit Arends

6. Bruno Latour and Steve Woolgar were among the first anthropologists and sociologists to study the daily work processes of empirical researchers at a scientific laboratory. Their book *Laboratory Life. The Social Construction of Scientific Facts* was published by Princeton University Press in 1979.

7. Donna Haraway's theoretical work on technoscience addressed scientific practices in a critical way. Her most well-known work is *A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century*, which originally appeared as an essay in the magazine *Socialist Review* in 1985.

academic disciplines. Also look at this whole area of citizen science, which I think fundamentally challenges the difference between professionals and lay people. Both are experts. In citizen science lay people get involved in the processes of collecting information and conducting science.

JH: I would like to add one more thing to this observation on citizen science, which often combines undisciplined research and tinkering. From my experience, what's at stake is not so much that artists question/reject scientists or vice versa. Instead, I feel that scientists often distinguish themselves from engineers, in a similar way that artists distinguish themselves from designers. I feel that these oppositions are related to how and for what purpose something is made. Artists and scientists are in line when it comes to reflecting on how they know what they know. There is agreement between practitioners of art and science when it comes to the investigation of knowledge production itself.

BA: Interesting in this regard is the degree to which the work of anthropologists, sociologists and historians of science, significantly Bruno Latour⁶ or Donna Haraway,⁷ has contributed to the analysis of scientific practices. Much of the understanding that artists have gained of these complex processes and the role of technology can be found in the work of these two writers. It has set the tone for artists' collaboration with scientists in my opinion.

KA: In discussions about art and science I often think it's more interesting to imagine a triangle that connects three points than a line joining two. If you have two points then all you're doing in mathematics and physics is drawing a line between them, while as soon as you have a third point you then create an area, a space for activity. Thus binary in that mathematical sense often means opposition and then compromise. Whereas if you have a third point it changes the relations. A couple of years ago, when it came to art and science projects we asked questions like: Why are we doing this? Who is this for? Is it just for the process? Is there an audience at all? Is it trying to stuff art down the throats of people who are interested in science? But now those questions have changed dramatically. There is a new urgency when it comes to connecting artists and scientists. The time when we used to believe that pure, best science would help change the world are gone. Now we think we need to change the health of the world, and the meeting of art and science has certainly much potential in this area.

Has working across disciplines and fields become more common in contemporary practice and education?

JH: I think it's important to identify terms that have the potential to produce linkages within a transdisciplinary education instead of concentrating on over-specialisation. There is the need to reframe the concept of a 'studium generale' and to ensure through transdisciplinary education that specialists can at least understand each other.

BG: I think it also comes back to the question of: What do we actually want transdisciplinarity to lead to? For example, if you look into the educational aspect of it I think it is good to have specialised courses, as it enables cutting-edge research. Yet I think that transdisciplinarity in formal education is really important, as students who have not yet been introduced to the 'other' discipline in a practical way can be very anxious about it. It might also be interesting to look at how artists and designers who enter the research culture also change it. And to look at how research is done because they might – hopefully – introduce the aspect of open-ended questions, as in: we don't have to have a hypothesis, we don't need to have a final goal, we just go down a path and see where it leads. I think this is or can be very valuable and should be acknowledged and accepted in the current research culture of science. I come across more and more people who have a degree in both a scientific and an artistic discipline by the time they leave university. So they already have dealt with the binary set-up at university. Meaning that they have not only gained experience in both the artistic and scientific ways of doing things, but also are familiar with how higher education affirms disciplinary thinking. I think these developments have an effect on precisely how art and science are perceived, on the one hand, and how they are conducted, on the other.

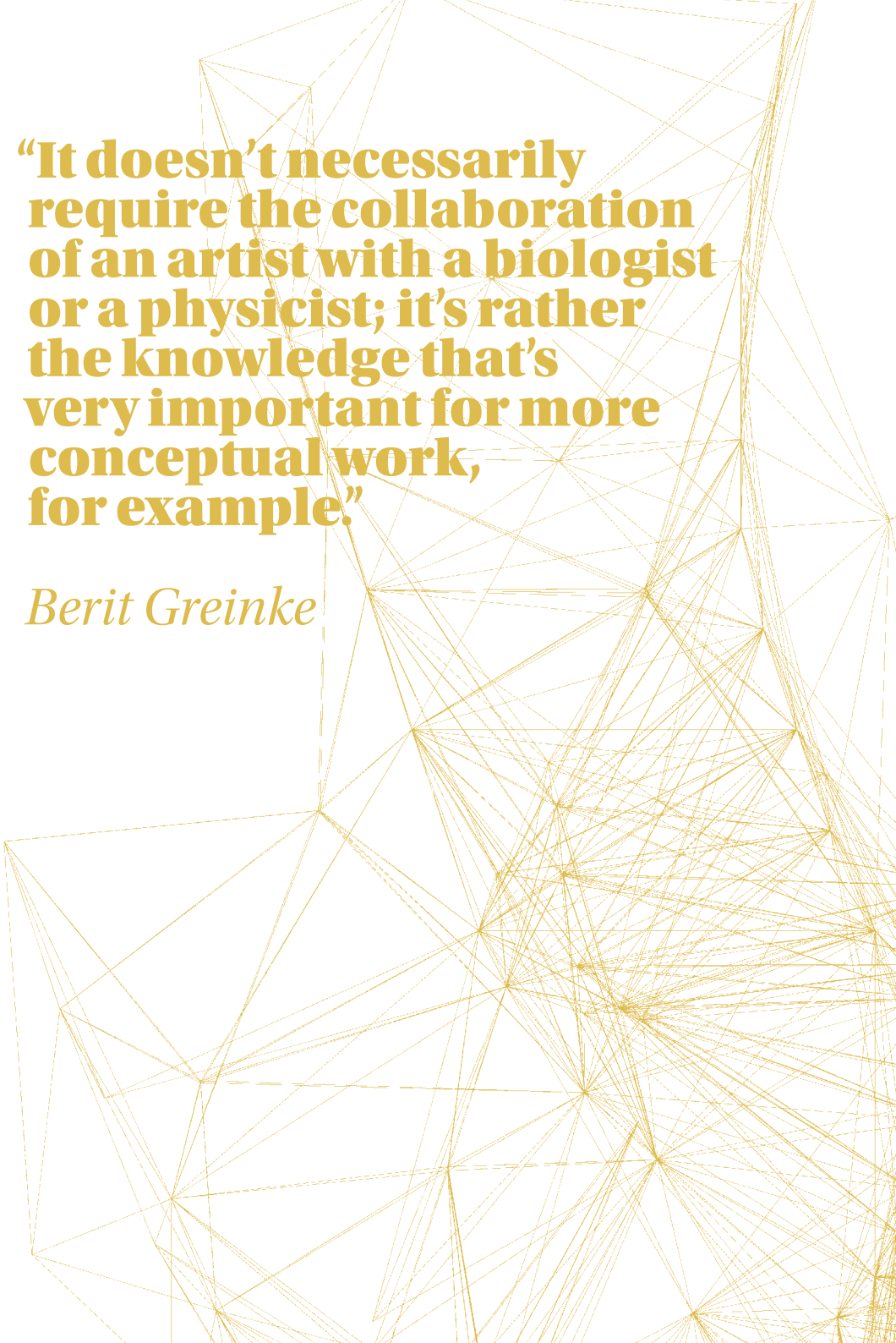
KA: Can anyone do art and science at the same time?

BG: Exactly. That would be a really interesting question to ask.

JH: We always hope for new Leonardo da Vincis⁸ and Frank Malinas⁹ but I think we should not be too disappointed when such figures do not often emerge. I was part of the board of the KLAS-Knowledge Link through Art and Science programme supported by Schering Stiftung and the Max Planck Institutes of Molecular Plant Physiology and Colloids and Interfaces. Within the programme 'hardcore scientists' were paired with 'hardcore artists' and the Bauhaus model very often came up in the discussions that accompanied their work processes.

8. Leonardo da Vinci (1452-1519) was an Italian polymath of the Renaissance whose areas of interest included invention, drawing, painting, sculpture, architecture, science, music, mathematics, engineering, literature, anatomy, geology, astronomy, botany, palaeontology and cartography.

9. Frank Malina (1912-1981) was an American aeronautical engineer and painter, especially known for becoming both a pioneer in the art world and the realm of scientific engineering.



“It doesn't necessarily require the collaboration of an artist with a biologist or a physicist; it's rather the knowledge that's very important for more conceptual work, for example.”

Berit Greinke

There were many discussions about expectations, outcomes and failures. Interestingly some biologists replied to the question: What can I learn from artists? with the assumption that given their design skills, artists could help design micro-fluidic devices. Another reaction was the hope that 'having an artist in the lab would encourage public engagement.' Another scientist said, 'I have learned to better explain my work to people outside my field,' meaning that he appreciated the necessity of acquiring some skills in the field of science communication. One artist, on the other hand, even claimed that 'artists can contribute to the advancement of science and fields that require imagination, creativity.'

KA: I think these are all reasonable expectations – the potential ways of bringing the two together are plural rather than singular.

JH: Well ...

KA: I know the two of us fundamentally disagree on this, even though we agree on so many other things. You must admit though that in principle there's nothing wrong with any of those expectations. Although you're someone who is interested in a much more philosophical perspective.

BG: I would say that probably most artists choose one type of science they want to engage with because it speaks to them for some reason. But I think you can also think about it in a more conceptual way. If I make an artwork that moves towards a specific idea I look at the respective fields of science and draw knowledge from them. It doesn't necessarily require the collaboration of an artist with a biologist or a physicist; it's rather the knowledge that's very important for more conceptual work, for example. Instead of holding on to categories such as 'bio-art', of which we all have an image in our heads in terms of what it looks like, we should talk about interdisciplinary or transdisciplinary emergence instead.

JH: That's why at the Broad Museum at Michigan State University I've recently chosen the title *MATTER(S) matter(s)* for an exhibition that concludes the Bridge artist in residency program I am co-directing on campus, *bridging research in the arts and sciences*. The main point was to insist on the shared materials and media that matter – since knowledge derived from scientific study is not 'pure', but deeply entangled with its technological tools and sociopolitical contexts.

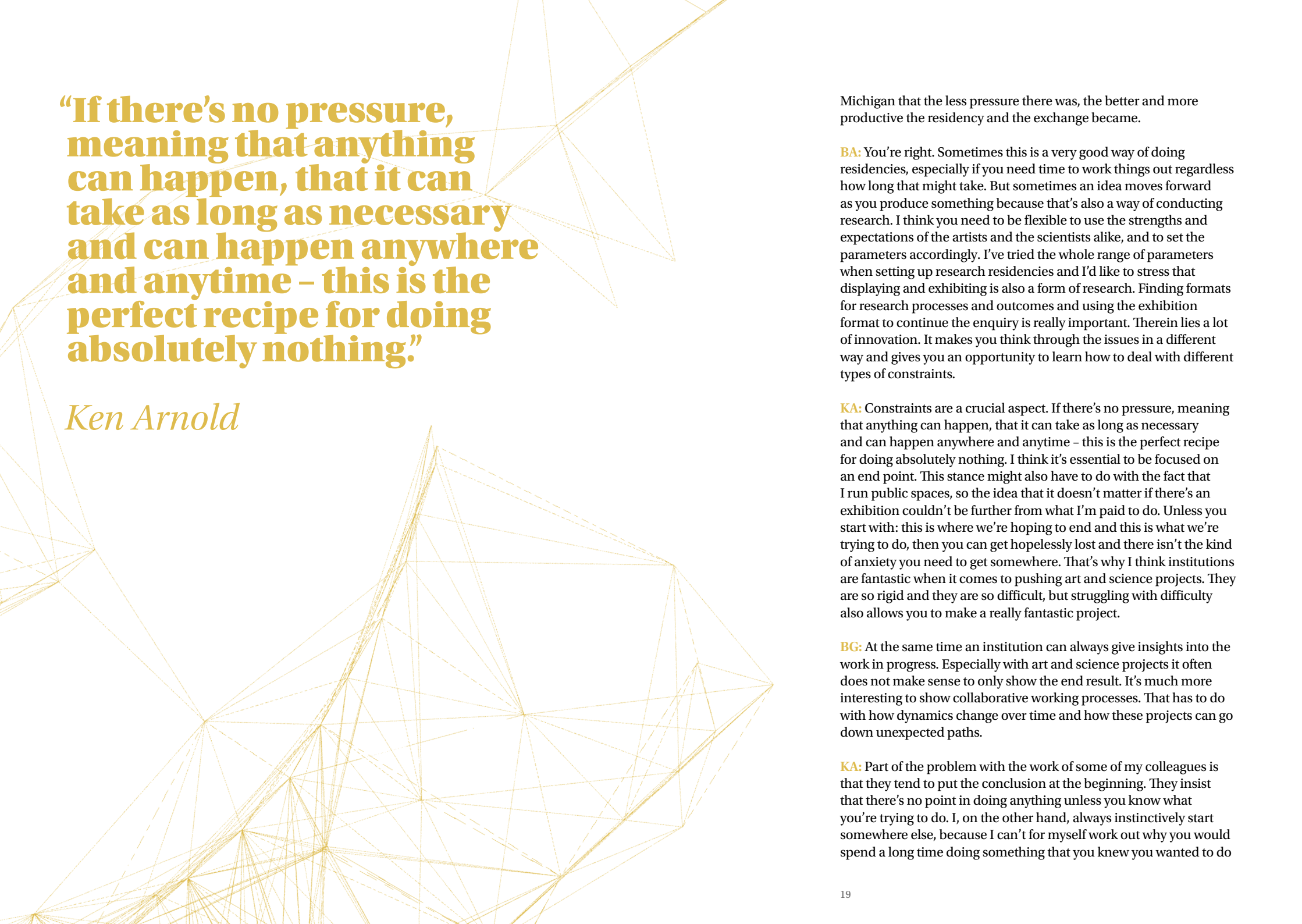
10. Metamaterials, a class of materials that can manipulate electromagnetic fields in precisely controlled and often unusual ways (e.g. negative refraction), are characterised by both their periodic structural composition and electromagnetic properties.

KA: To me it seems that we start out with an almost missionary zeal to bring together those who have never left their lab with those who have never left their studio with the – rather idealistic – idea that sparks will fly and wonderful mixtures of ideas will come about. Maybe nowadays there is less need for that as educational practises are changing, allowing people to explore their own variety of interests. Maybe there is no longer a need to bring people together?

BG: I don't think that we now resolve possible clashes of culture by completing both an art and a scientific education. I don't even think that would be very valuable. Rather I think it is always positive to bring people together. The specific value lies in bringing people together who would have never thought about working with this specific field or with each other. In our education everything is focused and the field can be very narrow. There is still a need to look at these very specific disciplines and to bring them together. When I decided to study towards a PhD it was always clear to me that I didn't want to do a PhD in design as I already 'had done' design. I was really interested in joining an engineering school in order to learn and do research in those areas that I otherwise would have never encountered. And that actually worked out really well. I had time to have conversations with researchers and professors from different fields within the school. I had time to decide on the topic that I wanted to work on for my PhD and came upon it when I learned about 'metamaterials',¹⁰ something I had never heard of. This step into the engineering school gave me the opportunity to really broaden my horizon and to also contribute to the engineering discourse through a design lens.

Do you consider the results of art and science collaborations relevant at all? Or is it really the collaboration process per se that is the most interesting aspect of bringing artists and scientists together?

JH: That's a good point. For example, among the diverse residences that I've initiated over the past few years is the one at the University of California, Irvine (UCI), where we set up a residency for artists interested in interacting within the research context of synthetic biology. We invited artists who wanted to work with macroscopic protocells and non-canonical amino acids, etc. in their artworks. But here, as well as in our artistic residency at the Bridge at Michigan State University, we made it very clear that there was no direct obligation for any participants to produce anything specific for an exhibition. We learned from these residencies in California and



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Ken Arnold

Michigan that the less pressure there was, the better and more productive the residency and the exchange became.

BA: You’re right. Sometimes this is a very good way of doing residencies, especially if you need time to work things out regardless how long that might take. But sometimes an idea moves forward as you produce something because that’s also a way of conducting research. I think you need to be flexible to use the strengths and expectations of the artists and the scientists alike, and to set the parameters accordingly. I’ve tried the whole range of parameters when setting up research residencies and I’d like to stress that displaying and exhibiting is also a form of research. Finding formats for research processes and outcomes and using the exhibition format to continue the enquiry is really important. Therein lies a lot of innovation. It makes you think through the issues in a different way and gives you an opportunity to learn how to deal with different types of constraints.

KA: Constraints are a crucial aspect. If there’s no pressure, meaning that anything can happen, that it can take as long as necessary and can happen anywhere and anytime – this is the perfect recipe for doing absolutely nothing. I think it’s essential to be focused on an end point. This stance might also have to do with the fact that I run public spaces, so the idea that it doesn’t matter if there’s an exhibition couldn’t be further from what I’m paid to do. Unless you start with: this is where we’re hoping to end and this is what we’re trying to do, then you can get hopelessly lost and there isn’t the kind of anxiety you need to get somewhere. That’s why I think institutions are fantastic when it comes to pushing art and science projects. They are so rigid and they are so difficult, but struggling with difficulty also allows you to make a really fantastic project.

BG: At the same time an institution can always give insights into the work in progress. Especially with art and science projects it often does not make sense to only show the end result. It’s much more interesting to show collaborative working processes. That has to do with how dynamics change over time and how these projects can go down unexpected paths.

KA: Part of the problem with the work of some of my colleagues is that they tend to put the conclusion at the beginning. They insist that there’s no point in doing anything unless you know what you’re trying to do. I, on the other hand, always instinctively start somewhere else, because I can’t for myself work out why you would spend a long time doing something that you knew you wanted to do

from the very beginning. That just seems a bit boring to me. So my sense is that interdisciplinary work is a voyage of exploration rather than a destination an airline has set. You don't know yet where you're going to end up. I suppose it's really important to be research oriented and to feel you're progressing, but at the same time it's essential to hold on to that sense that you don't quite know where you will end up.

JH: I like to think of it this way: first, you don't know what the best path is so you keep changing tracks. But changing tracks means that you may need to change tools, too. With every different tool, however, comes a very different mindset. In the end you are finding your own path, which also depends on the tools you end up using.

BA: Besides, there's a demand now – given the existence of social media and so on – to reveal the working processes behind an art piece. Take for example the Tate project *Reshaping the Collectible: When Artworks Live in the Museum* I'm now working on. The aim of the project is to develop refined models for the acquisition and care of contemporary works of art that challenge the museum, such as performance art or software-based time and net art. We've just done two major workshops with both public and closed elements and realised that we really should communicate the amount of research we've been doing beyond and as a part of the workshops. It's additional work, but it's also quite easy to let your audience take part in the processes, for example by means of a website or even within the exhibition space.

BG: Let me ask one question though: How do you think this would change the objects on display? Would they be seen as scientific objects rather than artistic ones?

KA: This is a great question for institutions with collections. If you're involved in promoting art and science projects the idea is not only to collect the final artwork but to make sure that the conversations along the way are being preserved as well. We do, however, need to be cautious with what we choose. I suppose one important skill of any curator working at a museum is to pinpoint those objects that might still be intriguing in the future.

BA: Yes, this is always a tricky task as we might pay attention to certain things now and then realise in ten years' time that we should have paid attention to completely different things. It can be frustrating sometimes, but this certainly reflects collecting and exhibiting cultures. On the other hand it's quite intriguing to

11. See O. Catts, "Discussion contributions to the online-symposium", in S. Anker & J.D. Talasek (eds.), *Visual Culture and Bioscience. An Online Symposium*, Baltimore: University of Maryland, 2008, p.120-121.

know that, for example, in a natural history museum you still have dinosaur bones stored in the protective plaster casts that were applied to transport them way back in the early twentieth century ... But to come back to museum collections: we do need to consider how these histories of collaborative practices, call them art and science or something else, are being written, documented and collected. What do we have to go by? What is left behind by these collaborations? Where do we find these histories? Who writes them?

JH: I'd like to come back to Ken's point regarding how institutions work and what their constraints are. Very often you see artists in labs simply dealing with, or struggling against, the constraints of the institution. In such cases the result of their working processes may even take the form of what in the context of art we call 'institutional critique'. Oron Catts, artist and co-founder of SymbioticA, the internationally well-known laboratory at the University of Western Australia where artists can acquire scientific methods and critically work with scientists, once described all the possible roles an artist might be able to take on when entering a science lab. Catt's taxonomy comprises 'the illustrator, the commentator, the visitor or onlooker, the appropriator, the entertainer, the user, the industrial worker, the hoaxer, the hobbyist, the afterhours under the table scientist, the mail-order ready-made artist in the lab, and finally the researcher embedded in a science technology setting'.¹¹ I am mentioning this taxonomy here to try and think of a situation where it is the other way round: imagine a natural scientist in an artistic context doing institutional critique within an art institution.

Can art and science projects provide solutions for pressing issues and can they foster innovation?

KA: I would put these questions differently. First, is it necessary for us to aim for a certain goal? And second, if the answer is 'yes' what would that goal be?

BA: It depends on the topic, but since you ask, I think environmental issues are a pressing subject to deal with. We've got changing climates, we've got biodiversity loss, and these are inherently interdisciplinary questions. These questions worry people. To address these issues environmental sciences need to work together with behavioural sciences, with engineers, with anthropologists, with cultural practitioners in order to understand scenarios and to imagine and rehearse alternatives that address this crisis.

KA: But should every topic be treated with some sort of urgency?

BA: Not necessarily. Sometimes you do something with a sense of urgency out of interest and only later realise the relevance of it. For example, I've worked with natural history museums, bringing in international artists to look at the history of the collections, also to understand how they embody imperialism and colonisation.¹² Since then decolonisation has, thankfully, become a huge topic of discussion. So you might as well start with something you feel intuitively drawn to. I say: do what you enjoy and what is urgent for you.

KA: For you all personally, do you want to make a change when you bring artists and scientists in contact with one another? Honestly, I'd like to admit that I'd be disappointed if I felt that nothing ever changed despite our attempts to bring different disciplines and people in contact with one another.

BA: But look at it this way: what you and Wellcome have achieved is, at a minimum, to give permission to work in a different way.

KA: True. I just think because the world now does expect there to be a goal of changing and improving things that this expectation should at least be borne in mind when working in this way. Wellcome is an organisation that has always been very clear about the need for vision and innovation and has done this as well as it can. I suppose the motivation for my work is thus to make the world a more interesting place.

BA: I agree. I share your interest in making the world a bit more interesting by drawing out the complexities that exist. What I tried to do was to reveal and to undo a certain monolithic way, practiced not only by institutions, of talking about the natural world.

JH: Don't you also feel that the aim of drawing out the complexities is a fundamental way of actually increasing consciousness and awareness towards supposed truths? In my opinion this is a fundamental function of art, and this is also what makes it substantially different from engineering or design. Art is also about criticality, in addition to sensuality, sensation and experience. I recently quite harshly critiqued the exhibition that the Centre George Pompidou in Paris has titled *La Fabrique du vivant*, as I found the mix of architecture, design, engineering, science and so-called 'bio art' – a term I have resisted since its inception – very naïve. The exhibition purportedly staged interdisciplinarity, but it

12. See also B. Arends, "Decolonising natural history museums through contemporary art", in C. Rossi-Linnemann & G. de Martini (eds.), *Art in Science Museums. Towards a Post-Disciplinary Approach*, London: Routledge, forthcoming.

“I think one of the fundamental strengths of art is not only to raise awareness, but to really, really, really be critical of each material, each sociological constitution and each institutional challenge.”

Jens Hauser

ignored art's potential and duty to be more critical than affirmative. This was a major mistake in my opinion because I think one of the fundamental strengths of art is not only to raise awareness, but to really, really, really be critical of each material, each sociological constitution and each institutional challenge.

BA: Just like the curatorial work, which also has to support this criticality.

JH: From my point of view as a curator, criticality is linked to the idea that art is less about providing answers and creative input to technological advances than it is about generating fruitful questions. Therefore, I view the term 'research' as two-fold. You can either do research to find a solution to a problem, or do research to look for new questions.

KA: From what I gather Schering Stiftung has an interesting approach compared to other organisations I know. They commit to collaborative interdisciplinary ideas. What they essentially do is to invest in ideas that might very well fail. However, they combine art historical and scientific expertise to provide the best possible guidance to art-science projects with the hope that they will prove fruitful while defining what 'fruitful' means along the way. This is quite a radical approach in my view, as I feel that there are not many institutions creating opportunities for unexpected outcomes. From my perspective this has to do with the fact that we live in such an evidence based culture now. We have no idea what fruitful is unless we've already determined what it is from the beginning, so that we can then get our rulers out and measure how fruitful something actually is. I suppose what I've latched onto in this art and science field is that you can claim to be fruitful and say this is money well spent without saying at the very beginning what fruitful will look like.

Are new formats of presentation needed for art-science collaborations?

BG: Traditionally scientific research presents knowledge through the medium of text, whereas in artistic fields it's more about artefacts. It's about objects in context, exhibitions, models and so on. So now the question is: How we can resolve this, how can we mix these two things? There have been some interesting first steps, for example traditional scientific conferences have started to include design exhibitions in their programmes. They often don't get the attention they deserve but at least they're trying to bring in other formats to show different ways of how people generate knowledge and make discoveries.

“I suppose what I've latched onto in this art and science field is that you can claim to be fruitful and say this is money well spent without saying at the very beginning what fruitful will look like.”

Ken Arnold

BA: I think the word 'resolve' comes up a lot. I actually feel that it's nice to keep things unresolved, or at least to include a broader perspective towards 'resolving' something, and to explore the tensions. There is drama in this.

KA: For me one of the exciting things about bringing art and science together is the possibility of slightly undermining confidence in both. It's a great starting point to find out new things. The agenda at Wellcome was initially to work with people who have very strong and interesting voices, but who exclude other people from their knowledge. Here the art of curation was to try and make each respectfully interested in the other, to encourage the collaborating partners to come up with new ideas, and to find ways of bringing their existing knowledge together.

JH: The question then emerges: How do you actually convey knowledge in a curatorial manner? How do you balance text, image, process documentation, etc. In this regard there is a helpful distinction made by German media philosopher Dieter Mersch¹³ who has argued that we are living in a culture where text-based discourses are generally articulating claims of truthfulness, while images are widely responsible for the production of evidence, which is a fruitful division of labour. I like this distinction a lot. And this translates into the decisions to be made when curating: What do you actually show? Do you place emphasis on the narration or on the physical object or on the remains of a process? All this becomes intertwined.

Speaking of intertwining – what kinds of environments can spark collaboration?

KA: I think space is incredibly important.

BA: Yes, I agree, from the archive and collection spaces, to the laboratory, to public spaces within a museum, and so on. These all inspire and can create events that draw attention to things or how to make something.

KA: There is something striking about Scandinavia, maybe particularly Denmark, where there is a noticeable focus on just making sure places are 'nice': nice to be in. It shouldn't be luxurious, it doesn't have to do with creating a space where you're not troubled with the rest of the world. It should definitely be in the world. But I believe you need to think very carefully about how to create the quality of the spaces you're working in. It has partly to do with comfort, partly with stimulation and partly with conversation.

13. Dieter Mersch (*1951) is a German philosopher who studied mathematics and philosophy. The current head of the Institute for Theory at the University of Arts in Zurich is an important figure in discourse on artistic research.

14. Chrystel Lebas is an internationally renowned photographer and filmmaker who lives in London. She graduated from the Royal College of Art and has exhibited widely in Europe and the U.S.

BA: It seems like we're talking about extreme privilege.

KA: I don't think it has to be a privilege. I mean, of course socioeconomics has something to do with it, but I think you can think about nice places and spaces without having huge financial resources.

BG: I would disagree with that. In my experience, the space or its quality is less important. It's much more about facilitating the exchange and facilitating the conversation. One of the most fruitful parts of interdisciplinary exchange for me has always been to hear and learn about new views and fields by bringing people into the space. And it doesn't matter if this happens in a beautiful luxurious lab or in a windowless room in the basement. This doesn't mean it is not motivating to work in transdisciplinary laboratories, but it won't necessarily lead to better outcomes or more collaboration. In my personal experience, it doesn't.

BA: I think spaces are important, I think they do generate slightly different ways of sensing that you are involved with society in slightly different ways, i.e. as part of a more mainstream or more of a fringe activity. I think the space contributes to that. But in the end the activities tend to flourish, or become better known, in places where you've got lots of institutions, where it's easy to get to, where you find people from many different backgrounds and where they are within easy reach.

BG: It also is a benefit to have people in the space who can facilitate a productive conversation.

What are examples of art and science projects that excite you?

BA: There was a project, *Field Studies*, which I really enjoyed working on. The research was inspired by the 'discovery' of a photographic glass plate archive in the Botany Department at the Natural History Museum in London. None of the outcomes were anticipated or could have been known at the outset of the project. The starting point was that I know the work of the photographer Chrystel Lebas¹⁴ and felt she might be an interesting person to bring into the museum to engage with this found archive. Once she was in the museum, we met with the curator of the Botany Collection who had pointed out the archive material with the words, 'Well, it's been here forever, no idea what this is.' Actually, a lot of conversations I have start like this: there's an intuition, a motivation, and something

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Berit Greinke

15. The Medical Museion is a project of the University of Copenhagen and the Department of Public Health, which is part of the Faculty of Health and Medical Sciences of the University of Copenhagen.

undefined. It’s all very open-ended. In this specific case we then found out that we were looking at a significant collection of early ecological photography about which fairly little was known at the time. It is a collection of about 1200 glass negatives which were then anonymous, an ‘orphaned’ collection. We ended up working with the botanists Mark Spencer and Kath Castillo and a number of other people just to look at the collection and to see what one could do with it, what kind of methods and methodologies we could apply in order to work on it together. We received funding, then the artist ended up doing field work, partly by herself, partly collaboratively, retracing some of the landscapes depicted in these photographs — and it sort of went from there. We ended up doing an exhibition at Huis Marseille and the Museum for Photography in Amsterdam with this research material. A bit later it was turned into a beautifully designed book, which won the Kraszna-Krausz Foundation Photography Book Award in 2018.

KA: There are two projects that haven’t taken place yet at the top of my mind at the moment. One is how to shape a museum in Copenhagen, the Medical Museion, that creates a link between two institutions.¹⁵ There’s the research side of it and the public side of it and the challenge now is how to make the most of both. On the research side, we sometimes describe what we’re up to as ‘critical medical humanities,’ which means we’re focusing primarily on the topics of medicine and health, using the toolbox provided by the humanities. So the question now is how to apply our humanities-based methodology to the subject of medicine and health. It’s a little bit like art and science collaborations. The other project on my mind is the next Wellcome project that I will do, which is based loosely on Wellcome’s interest in mental health. It will take place in two locations at least – Berlin and New York – and there may be two or three other cities. And the big question for us is how to encourage a project that ends up being about mental health, rather than it starting off as a project about mental health – that you discover the theme through the visitor experience rather than through the title and introduction. It’s about finding interesting partners to work with and an open invitation to see art and science, both of which, I’m sure, will be an integral part of the evolving projects.

JH: For me, the crucial question at the moment is how to create operative structures involving art and science and how these structures can then activate epistemological links within different fields of practice, to generate different outputs, such as books, exhibitions, conversations, walks, performances, festivals, residencies, etc. How do all these practices enhance practice-based and material-based research, which can take on different forms? These are questions that I've been working on over the last few years under the label of a long-term research approach that I have coined 'microperformativity'. This concept has a lot to do with my personal obsession with the question of how in the age of both the Anthropocene and great biotechnological advancement we can actually overcome anthropocentrism and look beyond our mesoscopic bubble. How can art/science entanglements link microperformativity and macro-matters in a way that fruitfully destabilises our mesoscopic human bubble? In December 2018 we drew attention to this notion within the framework of a large festival in Vienna at the AIL (Angewandte Innovation Lab) of the University of Applied Arts called *Applied Microperformativity*. It encompassed artistic practices and research, and favoured resolutely cross-disciplinary practices ranging from DNA fingerprinting and microbiome performances to audio plays and experimental dinners, and beyond. The notion of 'microperformativity' is currently being advanced even further through a special publication, *On Microperformativity*, which I am currently co-editing together with the performance artist Lucie Strecker.¹⁶ The journal includes contributions from many disciplines: from performance studies, theatre, music, as well as experimental contributions from the field of economics that reflect on micro-transactions in stock markets and on how the stock market works at fractions of seconds. For me the success of the concept is that it seems to work as an open source format that can be used by other people from manifold viewpoints, and that these different viewpoints can then interact in unforeseen ways. In the age of the Anthropocene there's a need for transdisciplinarity because many of the related problems can only be solved with the help of very diverse practices.

BG: I'm also going to talk about something that hasn't happened yet or that is just starting right now. It's a research project that is linked to my position within the University of the Arts Berlin and the Einstein Center Digital Future. I am in the privileged situation of not having to have a hypothesis. My funding was confirmed before I even wrote a proposal. The project itself is about exploring the millennia-old textile technique of pleating in the context of tangible interaction. Pleating means folding fabric and affixing it with steam.

16. J.H. Hauser & L. Strecker (eds.), *On Microperformativity*, *Performance Research*, vol. 25, no. 3, London: Routledge, 2020.

“I think expert culture is great. I would never move away from it; you need to be an expert in something.”

Bergit Arends

Today the technique is used mainly in fashion and costume design but it's also something that is relevant in science and engineering fields. Some people connect it to geometry and geometric studies, which means that it is of interest to mathematicians, biologists, physicists, fashion and textile designers, to name just a few. What I personally find fascinating about it is the creative potential when linking it with electronic textiles, textiles that can sense changes in the environment. It is an extension of some of the research I completed for my PhD project, which examined three dimensional electromagnetic textiles that behave in very unusual ways. I can't say where this new research project is going, as I deliberately left it open. In terms of science and engineering, I am mostly interested in bringing physicists and electromagnetic engineers to the table. We will see what happens. I don't know where it will lead, but we will be working on this project for the next three and a half years.

Will we all sooner or later become multi-disciplinary?

BA: I think expert culture is great. I would never move away from it; you need to be an expert in something. I think it's really important to know where your home is as well, to have references and knowledge within a specific field.

KA: Do you know where yours is?

BA: *(Laughter)* Good question. I'm a curator. I'm therefore also a generalist by profession, somebody who convenes. As a curator you utilise techniques and knowledge for convening, as well as histories of assembling ideas and objects. But I'm saying this because I think you need to have an edge, a topic that you work towards as well. You need to have something to offer, something that you can therefore also undo or unlearn. But I think it's good to have a home.

KA: I totally agree with you. Certainly, there would be no interdisciplinarity without disciplines, would there? There's no point in bringing eight multidisciplinary people together. That would be the dullest party ever. The excitement comes from the potential of misunderstanding, and you can't misunderstand if everyone sort of understands everything about everybody else.

“The excitement comes from the potential of misunderstanding, and you can't misunderstand if everyone sort of understands everything about everybody else.”

Ken Arnold

Editorial Note

The **Hybrid Plattform** is a cross-disciplinary project platform on the Campus Charlottenburg. In this pilot project from the Berlin University of the Arts (UdK) and the Technische Universität Berlin (TU Berlin), artists, scientists and experts collaborate beyond their individual disciplines and universities, investigating future-oriented topics and issues. The results are unique projects, new networks, further platforms and innovative approaches for teaching and research.

The **Schering Stiftung** promotes the life sciences, the contemporary arts, as well as scientific and cultural education. A key focus of the foundation's activities is on projects at the interface of science and art. This includes exhibitions and dialogue formats that bring together scientists, artists and the general public. The Schering Stiftung is an operational foundation. It develops its own projects and programmes and realises them alone or in collaboration with partners.

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Editors: Nina Horstmann & Christina Landbrecht

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Graphics: Marije de Haas

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Hybrid Encounters Events

Nina Horstmann & Ewelina Dobrzalski (Hybrid Plattform)

Christina Landbrecht & Katja Naie (Schering Stiftung)



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