

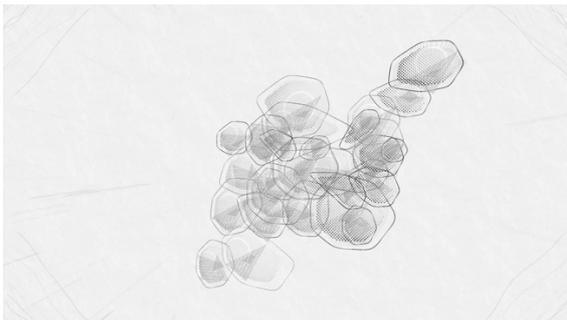


## <sup>1</sup>Julie Freeman: Artist Computer Scientist

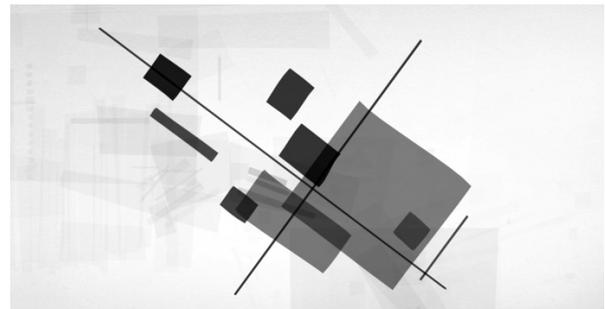
*Reflection-in-action...seems to acknowledge the moments when you 'know' that something is right. These moments of decision making are hard to describe but they are essentially built from layered and various past experiences that coalesce in a single moment. ...Reflection-on-action suggests to me using an action as a focus and exploring it from a number of perspectives.*

Julie Freeman is an artist and computer scientist whose work explores the relationship between science, nature and how humans interact with it<sup>2</sup>. She is deeply curious about the natural world and at the same time fascinated by the interactive possibilities of digital technology. Her artistic focus is on how to deploy that technology to 'translate nature'<sup>3</sup>. Her pioneering work 'The Lake' used hydrophones, custom software and advanced technology to track electronically tagged fish and translate their movement into an audio-visual experience<sup>4</sup>. She has a PhD in Media & Arts Technologies from School of Electronic Engineering and Computer Science, Queen Mary University of London<sup>5</sup>. Julie translates real-time data generated by wildlife into soundscapes, animations and other visualisations. In this way, she uses the unpredictability of data to give audiences different kinds of experience: "a contemplative experience of nature- through data- in which I try to evoke a similar effect as watching the sea, or other mesmerising natural motion"<sup>6</sup>. In her quest to uncover and extend audience experience, Julie is asking questions like: "How does technology mediate the way we understand the natural world? And how can we change our perspective and thoughts based on new knowledge about nature that technological systems bring?"

Combining art and technology and research is central to Julie's creative reflective practice. She has developed her practice in a mixed cultural and learning environment, which has given her a high degree of flexibility in the repertoire of ideas and skills available to make artworks. For her, the role of digital forms and methods for construction through coding is a pivotal underpinning to the character of her art, which involves the transformation of large complex data sets into objects and animations. She believes that for artists who use digital technology, learning to program computer code is essential. Observation of and communication with audiences has been an important aspect of the reflective practice that raises questions about the impact on artistic intentions. Julie aims to create experiences that prompt people to different states of contemplation, a form of reflection-at-a-distance that brings greater understanding of her work.



**Figure 1: A Selfless Society (2016)**  
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**Figure 2: We Need Us (2014/2018), single frame from Planet Four: Ridges animation**  
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In Julie's interview, she describes the various ways in which she engages audiences and at the same time retains control of her artistic vision.

## Interview

*Q: Can you describe the kind of creative work you do?*

J: My work tends not to have a distinct narrative or obvious message, although all the works are grounded in a lot of research that can be taken or left by the audience. It is up to them to dig deeper to look for my intention or inspiration or observation. If there is a spectrum of contemplative←→spectacle my work is at the former end. Projects like *The Lake*, *We Need Us*, and *A Selfless Society* are all created as pieces that you can spend a long time with, works that hopefully provoke meditative thoughts or encourage relaxation as nature itself might – a similar feeling to looking at the sea or a flock of birds or clouds over and over again, and for a long while. If my work can trigger even an element of this feeling, it would be an honour.

At Big Bang Data exhibition, *We Need Us* was installed on a large screen in a separate room. I had two women tell me they got to that point in the show and breastfed. This wasn't my intention (!) but I think it says something, the work allowed them to pause despite it being a real-time constantly changing experience, to them it felt like a safe space. Some of my other works have a more direct impact: the naked mole-rat photos with their eyes redacted<sup>7</sup> send a very strong activist message, as they immediately trigger a question (why?) intended to lead to a response about the data privacy of animals.

The dynamic aspect to my works which use real-time or live data has become more important to me over this past decade. It's a fundamental reflection on life and death, the concepts of reanimation, of animacy in inanimate objects, the desire to pull biological life into our increasingly digital lives... it's about flux and change. I've been describing the data within my work as an art material, something malleable, transformable, and time-based - this way of thinking about data has freed me from harder constraints and precision of academic data science (as we see on a daily basis that data is a tool in the post-truth society I've inserted the word academic here to refer to precision, accuracy and repeatability). It has also encouraged me to think about the nuances and variations of data, aspects of data which we need to describe more accurately. An encounter with art using real-time data is very different to art using static data, the meaning shifts with a 'living' data-feed and the experience becomes heightened, more urgent.

*Q: Tell me about your interest in data?*

My interest in data has always been in the fact that it is the communication channel between things: machine to machine, animal to machine, machine to human. No matter where you look in the digital realm there's always a stream of data connecting us to everything. For me this idea of using data as an art material seemed like a no brainer coming from a technology and art background - how can you make art about a digitally affected society without considering one of the most pervasive subjects around? I have been looking at data below information and knowledge, further down the triangle, data at a level beyond discrete values and toward an amorphous material, malleable, changeable, time-based material: something that changes over time but obtainable, something constantly moving like small bacteria or another cellular organism. In the paper<sup>8</sup> on a taxonomy of data- I describe how we use data as a broad catchall phrase even though each set has loads of different properties, for example whether it comes from a biological source, or a mechanical source like an aeroplane or car, whether it's real or synthetic. I discuss how is it delivered- is it streamed is it real-time, is it archived, is it static? And then how it is created - generated from a natural source or is data begetting data, that is, is it cultivating or replicating itself? There's all sorts of other properties around data too (i.e. distribution, format, etc). My interest initially is in this idea of a material that will bring dynamics and vitality into my work instead of me programming it in. I'm also interested in trying to work out how we begin to think of data as not a single thing but as lots of different things which allow us to connect to different parts of our world in different ways (#notalldata).

*Q: How does this relate to the notion of 'materiality' in art?*

J: I think when people are talking about materiality it's a more physical thing. For me, because I'm so familiar with the digital world which is essentially an intangible thing that you can't always grasp- I can picture data and its infrastructures as material even though they are essentially electrical signals. There's

an element of exposing the invisible or uncovering the hidden networks. but more intriguingly, it's also about using hidden techniques (e.g. algorithms) to expose something that *is* visible that we are just not looking at and not seeing. For instance, with the mole rats, I can see them and I can watch them but not many other people are allowed into the lab to look at them. So I am gathering their data, using it, interpreting it in different ways to make sound or animation, it seems like I'm showing something that's invisible but I'm not: I'm translating from one language to another, be it a language of values to a visual language or an algorithm to a soundscape: it's a form of communication, of sharing a perspective in a different way.

*Q: How are you showing what the mole rats are doing?*

J: There's an abstract animation which is the data in real time, sped up and slowed down. It also has a soundscape: the data is triggering the soundscape (<http://rat.systems/selfless-society> - press d for a secret data layer and sound tool). The data is also used to move a series of soft robotics sculptures and there is a straightforward information visualization. In this particular project, the mole rat data is being used as an art material; then there's many different outputs - animation, design, sculpture.

*Q: In revealing the data in that way are you representing it in a form that people can understand that they perhaps wouldn't from the raw data?*

J: Yes, there's a layer of knowledge transfer with the visualization. However, with the animation, because it's abstracted, it's very much an artwork; you're getting some information from it, and you're getting an experiential perspective. I don't intend to convey information through the abstract work, it's about an essence. I can decode it but it's not really there for somebody to decode.

*Q: How does a new project start?*

J: I sketch a lot and the sketches are often diagrammatical. I map out systems and the data invariably comes in at one point and then goes out in various directions through different mechanisms, through animation or through sculpture, through sound. It's all about how you get from a to b and what are all the components in the middle and where does the magic happen to turn the data into something interesting. One of the interesting things about a PhD is that I am having to explain the intricacies of the creative development process more than I did before. Sometimes I just know how things need to be and there are certain elements which spring from the gut that I tend to leave to the last minute when there's almost always no time to change it. But through interrogating the process more deeply the line between logical thoughts and artistic leaning becomes more blurred and rubbery; reasons become visible, and apparently instinctive processes reveal themselves to be steeped in prior knowledge and experience.

*Q: It's often said by artists: "I don't think about it, I just do it. It just happens." I wonder if you have any thoughts about that?*

J: Some bits I don't think about, like I don't sit down and think I am going to make a piece of work, I am going to come up with an idea today. That never happens. The idea to do something will come from a random moment from somewhere else. I'll have an idea and then the conscious thinking starts when I try and work out how I am going to make this happen. But that very beginning bit obviously comes from a whole lifetime of experience, from reading things you are interested in and from making random connections and being interested in a diverse set of things, some will fuse in your head but is often really difficult to pin point and explain. The old idea that if you could explain a work fully enough you wouldn't need to make it springs to mind.

*Q: How do you make decisions when you are making something?*

J: Sometimes that's really easy because it's a technical decision (it has to work on a certain platform in a certain way) or it will be 'I want to use this new technology, because I haven't used it before and this is how we are going to do it in the future'. Some of the decisions are dictated by the direction global technology is taking - I'm fascinated about where we are going next, and which technologies will shape our world. For instance, The Lake used bespoke tagging and animal tracking systems but now (14 years later) these technologies are off the shelf and are helping conservationists protect endangered species. My

work with soft robotics is also an early tech - it won't be long until Boston Dynamics produce an organic looking robot that resembles a soft giant hairless critter.

Non-technical decision-making, aesthetic ones, are harder to unpack. From early in the project I'll work with visual inspirations and notions – for A Selfless Society the work of Ernst Haeckel was important, and the idea of creating a pencil-like digital drawings. That steered many decisions to make lines softer, and the palettes were synthesised from a combination of his drawings and photos of the animals. This colour palette technique is one I use a lot, but this time I built a tool to semi-automate it – an example of my process changing even if the original notion exists across artworks.

*Q: Is that a good thing within your collaboration?*

J: Yes. And it's risky. I am quite a high-risk taker in what I do because I love to do things that haven't been done before. I like the inventiveness and using certain technologies in ways they weren't designed for. When I feel I can see the potential for something, I'll explore that conceptually and where it might be going and then often that then maps technologically into “well if you want to do that we'll have to build our own tools”. This is very common in my work. You wouldn't paint a picture in the style of another artist just because you've got the same materials. I guess there's an analogy where although you are using the same tools, like Net artists and many other data visualisation people, the way you use them is different...

My aesthetic tends to be an end result that is quite a simple almost gentle, experience, with a dose of “everything is really complicated behind the scenes”. Thinking about the idea of complexity in interactivity, I did a work (*Specious Dialogue*) where you could have your picture input and record a sound and have it merge with the works output. I ended up taking the interactivity out because I felt people were missing the concept as they were so busy playing with it at a surface level: “oh is that my voice?” or “look when I clap my hands it did this”. I stripped the interaction out and the work was much more successful – it was simpler and people engaged with it in a very different way, a much more thoughtful way in my opinion. Once interaction was removed, people played with the objects in the way I wanted them to. Since then I haven't really focused on interactivity, if anything it's the animals that get to have all the input. My interest is in making things that people can experience and contemplate and think about without clicking buttons and having an interaction learning curve to get feedback straightaway.

*Q: Are you thinking about the audience during the process of creating a work?*

J: I am thinking about myself as the audience. What I want to have at the end is something I want to see and hear and experience. I think I have a very traditional approach to what my audience will be and I think (and it's probably not very fashionable) but I think that I'm making work that people could just encounter as they would from a more traditional art gallery. It's a process where I expect the audience to think about what they are looking at or listening to. I like placing work in unusual places such as a lakeside or in a festival, but I guess I have an expectation that it will be treated as art, and not advertising or entertainment.

*Q: What does the term 'reflective practice' suggest to you?*

J: I would say that it suggests a practice in which the practitioner is continually aware of their process and how it changes and develops over time. That past processes are brought forward into present projects and adaptations based on previous learnings are incorporated. Prior to reading a summary of the theory, I would have possibly limited the reflection to practical and intellectual considerations and not emotional ones. However, it is clear to me that many of my choices within my practice (who I work with, how I work, where I work) are driven by emotional experiences. For example, over time I have learned when to walk away if things feel wrong, I've also learned that I struggle letting go in certain ways so I need to be alert to this. A question that occurs to me about 'reflective practice' is whether any artist practices without reflecting and evolving their work or processes?

*Q: What do the terms reflection-in-action; reflection-on-action suggest to you?*

J: Reflection-in-action is the term that I find most interesting because it seems to acknowledge the moments when you 'know' that something is right. These moments of decision making are hard to describe but they are essentially built from various and layered past experiences that coalesce into a

single moment. We see this with very skilled and experienced makers. The 'in-action' element suggests that the reflection is happening at the same time as the activity, which is in opposition to the more usual way of thinking about reflection as looking back on something that has happened. Reflection-*on*-action suggests to me using an action as a focus and exploring it from a number of perspectives – practically, conceptually, emotionally – plus the variety of impacts it may have had. In my work I would say that I often instinctively perform reflection-in-action, not always and not consciously. There are moments of risk-taking that sit outside of my experience which are important in keeping new work exciting, which are harder to reflect on at the time or, dare I say, reflecting too hard would steer me away from doing things if they echo any failure from the past.

*Q: Which is more interesting to you, the process of getting there or the object and how the audience responds to it?*

J: The process is my practice. Yet, it's always important that the audience responds to it - I can't hope for much more than a positive reaction- but ideally something that triggers a lot of thought for them about what's going on and why we're doing it. I know when I'm happy with a work, but I really want other people to like it and engage with it in ways that I hadn't seen.

*Q: Do you like to be surprised by their reaction?*

J: And also, I get surprised by the work. Because I am working with real-time data, with animal data in particular, I can never predict the data flow, the rate of change and all of that that comes with it. There are elements that I can control within my system and there's elements that I can't control. The latter makes me really happy because sometimes I can sit and listen and be with my own work for a really long time, and it can still surprise me as it's changing and shifting in ways I can't predict. I just want to be with it. I've made static works in the past, but I don't feel that they have a sense of life and change within them, so they are more transitory. With my animated work, I never tire of it and that's what I want the audience to experience.

*Q: Do you work alone and then do some collaboration or is collaboration the norm?*

J: I say 'collaborative' in the sense that I often work with people to help realise my ideas and there's always a backwards and forwards influence. But I guess I'm an instigator. I look for a different way of thinking in my collaborators, and the long-term ones such as Stephen Wolff (musician and coder) and Hannah Redler-Hawes (curator) are additive to my process, I learn stacks from them. I am working Professor Kaspar Althoefer, a soft robotics expert and our relationship is mainly about him talking about what could happen in the future of soft robotics. Our talk is very conceptual: I love that. My naked mole-rat collaborator, Dr Chris Faulkes, is an expert evolutionary biologist who I could listen to all day. So much technology follows biological patterns; every technologist should have a biologist in their team.

*Q: Are there other collaborations where you don't have certain resources or skills or expertise and you bring them in to implement a work?*

J: Generally, with programming that's what happens. I get to the limit of my abilities and then I'll work with someone else. I don't have any one person I've worked with again and again. I was thinking about it recently and thinking I would really like to work with the same people because they begin to know how you work and your practices, so I've consciously started to do this. An ideal set-up is to mix the old familiar people with new ones - that way you get the best of past experiences and new thinking all at the same time.

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<sup>1</sup> Portrait of Julie Freeman: Photographer: Bret Hartman/TED

<sup>2</sup> Julie Freeman: Translating nature: <http://www.translatingnature.org/about/>

<sup>3</sup> Art and Science - Julie Freeman's artist profile. In *Materials Today*, Volume 12, Issues 1–2, January–February 2009, p. 48.

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- <sup>4</sup> *The Lake* is featured in Art + Science Now, 'How scientific research and technological innovation are becoming key to 21st-century aesthetics', Stephen Wilson, Thames & Hudson, (2010)
- <sup>5</sup> Julie Freeman Defining Data as an Art Material <http://qmro.qmul.ac.uk/xmlui/handle/123456789/31793>
- <sup>6</sup> The Artist who Paints with Data <https://www.accenture.com/gb-en/blogs/blogs-artist-paints-data>
- <sup>7</sup> See the gallery on <http://rat.systems>
- <sup>8</sup> Freeman, J., Wiggins, G., Starks, G., Sandler, M. (2017). "A Concise Taxonomy for Describing Data as an Art Material". OPEN ACCESS concise version, MIT Press, Posted online February 16, 2017.