New Aesthetics for a Data-Saturated World (The role of SciArt in our Society)

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Preparatory workshop for the RESONANCES III Festival on BIG DATA
Organised by European Commission Joint Research Centre

Milan, 20 Oct 2017 - Lise Autogena and Joshua Portway

We are artists and since the late 1990's we have worked with big data in the realisation of our projects.

But the use of data in our work is not a premeditated method of working for us. New ideas always require a process of of finding out what is the best way of realising them.

Our most recent work has explored the current situation in Greenland - how the drive to achieve independence from Denmark has led to an urgency in selling of uranium mining rights to foreign mining companies - we made a film that explored how this decision impacts on Greenlanders sense of identity and visions for a long term future - Perpetual Uncertainty currently exhibited in Hasselt in Belgium.

Another recent project has explored how a sense of identity and belonging can the interaction of sound and landscape identity invisible cultural heritage piece of music - it was a musical requiem for the disappearance of the foghorn from the British Coastal landscape - working with the idea of the landscape as shaping of an emotional attachment - also in acoustic terms, we developed a technology that made it possible to control the horns of ships miles out at sea - how they were affected by th landscape, temperature, wind patterns and atmospheric conditions. In doing so, we made the North Sea into a massive stage, where sounds traveled miles across the sea to reach the audience in time with other instruments in the orchestra. We commissioned Orlandi Gough to compose a piece of music which was performed by 50 ships on the North Sea, 3 brass bands and the foghorn of Souter Lighthouse. So this project involved thousands of people in it's making. This project was not realisable without the desire to take part

So in our work we often explore how an imagined poetic or utopian image can become a shared idea and how such a shared idea, that may not be possible to realise, creates a sort of space for people to inhabit. has the potential to bring people ti can bring people together round it's realisation. There is nothing as strong as the transformative power of culture and what is shared.

[SLIDE - Black Shoals title]

Black Shoals was a project we developed in the late nineties in which we visualised the global flows of capital as a planetarium of thousands of stars.

[SLIDE: installation photographs]
The installation consists of a dome suspended in the gallery, filled with tens of thousands of twinkling stars.Every star represents a company traded on the world's stock exchanges, and the system is connected via a real time data feed to every major stock market in the world.

[SLIDE: star circle image]
Whenever a stock is traded the star representing the traded company glows momentarily brighter, giving off light proportional to the value of the exchange. So if you're standing, looking up at the dome, and you see one of the stars just flicker very slightly you know that

and that exact moment, somewhere in the world several million dollars have changed hands. And if you're watching when the new York stock exchange opens the entire sky seems to light up for a minute or so, as billions of dollars of overnight trading is settled. Here's a bit of video from the BBC of what happens when the new york stock exchange opens

[VIDEO : BBC Click new york open]

Throughout the course of the exhibition the stars slowly drift and coagulate into constellations. Stars are influenced by gravitational forces that attract them to each other based on connections between the companies - for instance strong correlations between their historical stock prices, or regularly being mentioned together in news articles.

[SLIDE: Star map] (pointing at screen)
That means that eventually you get differentiated constellations, like the petrochemical nebula, or the biotech cluster - and so, slowly, patterns appear and eventually a strange kind of order starts to emerge,.

[SLIDES : creature images]
Living amongst the stars is an ecology of artificial life forms that feed on the light given off by trading activity and they evolve over the course of the exhibition. They start off as random collections of random genes, and gradually they learn to learn to live in this strange world that we've built for them that consists entirely of money.

[VIDEO : bbc click creatures video]

In the period in which we were developing black shoals - around 2000 - a change was taking place in how people talked about the global financial system. The language of complexity theory, and in particular of complex adaptive systems, which had been developing since the sixties, emerged into the popular consciousness. These theories had been developed in places like the Santa Fe Institute by interdisciplinary teams of researchers, and many of the ideas had grown out of the study of natural ecologies and the interactions of agent based systems. Researchers were building agent based models of the financial system, and thinking about it using the same models that they had been using to model biological and social systems. And at the same time, the growing financialisation of the economy was being driven by ever more complex financial instruments whose interactions and behaviour were extremely difficult to understand using conventional models. The economy seemed to be booming, because the new financial instruments seemed to be able to create money out of thin air.

If you read something like Wired magazine during this period it was full of praise for the magical power of the financial system. Financialisation, and these new derivative financial instruments, seemed to be creating an emergent new world which transcended the flesh and blood world of human labour. And this new world was explained and theorised in the new language of complex systems and chaos theory.

Now - It's perfectly valid to model the economy in the same way that you might model a natural ecology, they do share some underlying mechanisms. But when you do that it's very easy to assume that you're studying something that, like nature, is pre-existing in the world - that's somehow also a natural phenomenon. But, in reality, the economic system is, of course, the result of very human authorship. Ultimately the financial system, money itself, is created through the retelling of stories and an act of faith. Like language, money is able to perform the primal magical act of creating something out of nothing, but it only continues to exist if you believe in it.

Fischer Black, Myron Scholes and Robert Merton were economists who developed a brilliant formula, known as the Black Scholes formula, that allowed investors to reliably calculate the value of a financial derivative, and therefore, theoretically, to hedge against risk. They won a nobel prize for the idea in 1997, and the same model is still the basis of most of the complex financial instruments traded today.

Based on the formula Myron Scholes and Robert Merton set up a company called "Long Term Capital Management" which, for several years, was spectacularly successful. It collapsed equally spectacularly in 1998. The initial causes of the collapse were complex, but primarily - as always with money - it was simply that investors stopped believing. A crisis of faith caused some investors to pull out of the fund, causing the company to have to pull out of positions that they had taken and thereby lose more money, which resulted in a feedback loop causing others to leave. With about 4 billion dollars of their investors money the company had leveraged positions worth over a trillion dollars and when they collapsed there was a very real risk that they would take wall street and the US economy down with them, until they were bailed out by the US government.

The year of the collapse of Long Term Capital Management, 1998, was also the year when we first actively started to develop the Black Shoals Stock Market Planetarium. We saw the story as a sort of Icarus myth about trying to control complex systems. When we started we understood almost nothing about the world of the stock market. Watching the news we might hear that the FTSE 100 had dropped, and we knew that meant bad things would probably happen in the future, but the connections between these abstract entities and real lives are invisible and mysterious, like the forces the ancient Babylonians thought were exerted on our lives by the stars of the zodiac. We nervously watch for signs and portents of the future in the market data just as they looked hopefully at the sky for news about the next harvest. And if we really try to stare hard at the system of global capital, if we actually try to wrap our heads around the scale and complexity of it, we also experience something like the sense of vertigo they might have felt looking up at the stars. Our planetarium was meant to evoke this very modern sense of the sublime. We were very interested in the strange beauty of data visualisations, and the seductive quality of data itself, which often didn't seem to be recognised.

It's important that the data feed to the dome is as close to real-time as it's possible to get. Since the first exhibition Thomson-Reuters has supplied the data feed for the piece, which informs us within a few hundredths of a second about any trade taking place for any of the tens of thousands of companies represented in the planetarium. In fact, Black Shoals is, by far, the largest consumer of data that Thomson Reuters supply - we consume several times more data than a major hedge fund, for instance - in fact when we showed the piece in Denmark we used the existing data connection of the Danish Stock Exchange, but it wasn't able to cope with the demands of the piece and Reuters had to upgrade the bandwidth and infrastructure of the whole stock exchange in order to cope. So when you stand under the dome and look up at the stars you know you're looking at at a large proportion of the world's economy, live. A single tiny flicker is millions of dollars moving around. And this produces a strange sense of vertigo - on the one hand there's a sense of power because the piece is designed to make you feel that you're at the hub of all of this information flowing into the room from all over the world, but at the same time there's a strong sort of floating feeling - a sense of losing yourself and of powerlessness in relation to the scale of it.

I think there's a sense in which this kind of experience of the sublime is important to the particular aesthetics of data visualisation, but it's a tendency that is generally unacknowledged and that we need to be suspicious of, because it's a type of beauty that results in a sort of paralysis and surrender. A lot of "big data" visualisations have this quality

[Slide - facebook visualisation etc]

These kinds of images remind me of a scene in Douglas Adams' Hitchhikers Guide to the Galaxy which describes something called the "Total Perspective Vortex". Being subjected to the Total Perspective Vortex is supposed to be the most awful punishment imaginable. The Vortex is a machine that attached directly to the victim's brain and for a moment it shows them the whole infinite wonder and beauty and complexity of the universe and, and in that image there's a tiny, tiny arrow, and on the arrow is a label that says "you are here".
And it's hard to know how to respond to that.

Untitled (Superorganism) -
This is a project that we presented in response to an exhibition called "monument to the anthropocene", although actually we'd come up with the idea a few years before in a slightly different context.

[Slide - ant project gallery view]
[Slide - ants closeup]
The circle on the floor is made of hundreds of thousands of dead ants, which also give the gallery a weird smell. And we have a video on the wall nearby showing the process of the piece being installed

[Video - ant video]

Ants are pretty simple creatures that individually follow fairly simple rules, but en masse their emergent collective behaviour allows the colony to function as a superorganism, solving very complex problems in elegant ways. As you probably know, ants lay pheromone trails behind themselves when they forage, and they have a simple set of rules which determine how to orient themselves in relation to the other ants around them. An Ant Mill is a phenomenon that sometimes occurs in Army Ants when they encounter a situation in which these rules don't make sense anymore. Stuck in a literal feedback loop, the ants will just walk in a circle, marching around and around indefinitely, with every new ant that arrives reinforcing the trail and making it harder for the subsequent ants to escape. There have been documented cases of ant mills hundreds of metres in diameter, containing millions of ants. They just keep walking until they die of exhaustion.

We don't have a straightforward interpretation of how we feel about this piece. It's easy to come up with obvious and over determined metaphors, but I think the most literal and bleak interpretations are hopefully undermined a bit because the ant circle is actually quite beautiful, and for me there's a strange ritualistic feeling to the behaviour of the ants which is quite unnerving. But there's obviously a connection between the ants in this piece and the a-life creatures in Black Shoals. The creatures in Black Shoals are growing and evolving and eating and dying in an environment that is entirely artificial, but which they experience as "nature". Both the ants and the creatures live within systems that they have no way to understand.

There's clearly been a preoccupation, in several of our projects, with the mechanics of complex adaptive systems, and how to develop an aesthetic that incorporates the ideas of complexity theory in a way that relates to our lived experience with more humanity than a picture of a mandelbrot set *(a particular set of complex numbers which has a highly convoluted fractal boundary when plotted.*). We've often tried to work with the idea of what it means to be an agent in an agent-based model of the world, and how the assumptions and parameters of these models shape our understanding of "nature". *(you can think of simulating things like economies as equations but agent based ways model things as lots of individuals each following rules that collectively form a behaviour - like the ants)*

[SLIDE: Fragile] I found this container sitting above the clouds at the astronomical observatories in La palma in the Canary Islands

SLIDE skies title
Most Blue Skies is a project we developed for an exhibition which was part of the COP15 climate summit, and it's probably our most direct engagement with attempting to develop some kind of aesthetic response to the ways in which our relationship with and our ideas of nature are changed by an increasingly data saturated world. When we were commissioned to make something for the official exhibition of the climate summit it was clear to us that there's no longer much point in just attempting to "raise awareness" of climate change. Anyone who isn't aware of its existence at this point is deliberately avoiding it. Most people who are likely to encounter our work probably even have some understanding of the basic mechanisms. It didn't seem to be our job, as artists, to simply try to attract attention to the problem or educate people about the science - marketing people and scientists can probably do a much better job of those things. So, instead, Most Blue Skies became a very deliberate attempt to examine our response to the increasingly complex and problematic idea of "nature" and its relationship to the technological and social systems in which we're embedded. The project is a quixotic attempt to answer a simple childhood question - what is the bluest sky in the world? And we approach the problem very seriously - absurdly seriously - using the most advanced resources available to us, including satellite sensing, atmospheric modelling, real time sensor networks and radiative transfer models developed by NASA.

[SLIDE : Blue square]
So when you first enter the gallery this is what you see - a modernist, James Turrell-ish square of blue light with the name of a place . The square of blue light is actually the exact colour of the bluest sky in the world, right at this moment, and the name underneath it is the place in the world where it's happening. It's simple, it's square, it looks like something you might expect to see in a gallery. We actually developed a special wide spectrum lighting system for the square of blue light, to reproduce the colour of the sky as accurately as possible, so the quality of light is rather beautiful. Looking at the blue square it's possible to imagine what it must feel like to be standing in that place, looking up at the sky. But behind this, in the back of the gallery, there's an array of computers, wires and monitors which can be seen downloading satellite data, doing atmospheric calculations and plotting the results of these sky colour calculations on a map of the world.

[SLIDE:Computers]
The computers are kind of messy and inconvenient and they undermine the beautiful simplicity of the idea of the bluest sky in the world. There's a tension between the simple prelapsarian idea of lying on your back looking up at the blue sky and the disproportionate complexity of the technology and the crazy amount of work we employ to try to answer the question.

[SLIDE:Blue map]
In fact we actually spent nearly a year consulting with atmospheric physicists, programmers and colour theorists to write the code to do the calculations, and over that time it became clear to us that all this work that we were doing was somehow part of the meaning of the piece. The effort required to create the piece - which, after all, results in only a simple blue square - is intended as a testament to the difficulty of sustaining this kind of optimism about our future. Simplicity has become complicated, and must be worked for.

On the one hand you could see this as horrifyingly alienating - but on the other hand it can be read as an attempt at an aesthetic that is neither a return to an essentialist nature or a technological dystopia, but a more subtle synthesis in which the complexities of the modern

technological world are acknowledged, but are not alienated from the natural world. Nonetheless, There's a lot of ambivalence, I think, in the end - about how the tension is resolved. We have ambivalent feelings ourselves - the piece is very much about us working through the process of making it.

When we were asked to participate in this event we were asked how we think we respond to and engage with data. And in the end I guess we still work in a very traditional way - we just try to be open to the tensions and contradictions we feel and be sensitive to the more complicated and ambivalent feelings which don't have an easy resolution - we then try to synthesise something out of those uncomfortable situations.

Where the work we've done have used data it tends to orbit around a few central interlinked theme - these are things like :

Thinking about complex systems - especially how the ideas of complexity theory have seeped into the public consciousness and produced new metaphors - for instance how it has changed our idea of Nature
(*Our idea of nature has been changed a lot because we think of most things in those terms now. For instance life itself, can be seen as a kind of complex system*
ecologies can be described in those ways
the basics of complexity theory are that simple interactions can combine together to produce complex outcomes
so, you take simple actions and repeat them enough times and you end up with something rich and complex and unpredictable like the way the economy works)

How has our increasing awareness of ourselves as bodies of data changed our subjectivity within the current economic system
(well we understand ourselves now also as our kind of presence in the world of data through things like facebook and stuff we can kind of measure our lives and understand ourselves so that becomes part of our idea of our self that in a way, in society, we are sort of constructed out of the accumulation of our data
various systems like amazon and facebook learn what we like and who we are etc)

What data "feels like" (by which I mean - does data itself have a sensual quality and how do the aesthetics of data shape our ideas)
All data lives within a frame of reference; data is meaningless outside the system that encodes it. Context specific, meaningless without. - We are not trying to visualise data as such, but exploring underlying data. When we've worked with data it's always been in the service of thinking about these underlying structures and systems rather than the data itself