

Results of Systems

Extended Catalogue Essay Project

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Results of systems

The concept of systems is very broad; through observation and investigation, one can find rules and patterns which govern how the world around us operates. Within the context of this essay, I will be using the term “systems” to define “a process from which a mathematical formula or sequence can be derived.” Over time, tasks which once relied on the laborious work of people have been handed over to technology, utilising science and mathematics to create processes epitomising efficiency and accuracy, creating an outcome that is the result of the combination of mathematical logic and the vision of whoever initiates these processes. As the ability to understand and define these systems has increased, so has the ability to utilise these discoveries in artwork. By doing so, artists have been “ridding art of biological metaphors, which they were replacing with analogies to mathematics and systems“ (Hobbs, 1982: 191). However, conveying these somewhat closed systems in the form of artwork allows them to be opened up for interpretation. Have artists submitted creative control of their work to science and mathematics? Or do they still retain control by manipulating these systems in whichever way they desire? And just how is it that mathematics and formal systems translate into works of art?

To address the theme of systems in contemporary art, I have chosen a number of artists that utilise specific rules and systems to create artwork. There is a variety of work that fits into the theme I have chosen, its origins can be scientific, mathematical, or digital to name a few. I will look at the various aspects of systems in contemporary art to determine how they influence and translate into artwork. These aspects are: Minimal and complex structures, in which I look at a number of artists and how they approach using systems in art over time, as well as comparing it to the theories and predictions of art critic Jack Burnham. I will also be looking at how artists such as Robert Smithson and Diana Thater use the variance of nature as their tools and objects to create work that gives the chaotic and seemingly random system of nature an orderly and rigid structure. Finally, I will look at how the medium of sound can be constructed in a systematic manner and exhibited by artists, specifically I will be examining the work of Carsten Nicolai and the sounds and systems he has chosen for their work, comparing them with Hans Jenny’s “Cymatics“ series of works.

Evolution of minimal and complex structures

In the early-mid 1960's, a number of artists living in New York (Dan Flavin, Donald Judd, and Robert Morris to name a few) were independently creating artwork that can be described as "geometric, more-or-less monochromatic, and generally abstract looking" (Batchelor, 1997: 6). These artists focused on accentuating the ideas of purity in form and shape in order to create a purely conceptual vehicle for which the ideas of the artist are conveyed. One of these artists was Sol LeWitt, an artist who chose to create work that refuted any form of objectification, instead pushing the idea of conceptual art with his work. About this, he writes:

"In conceptual art the idea or concept is the most important aspect of the work. When an artist uses a conceptual form of art, it means all of the planning and decisions are made beforehand...Conceptual art is made to engage the mind of the viewer rather than his eye or emotions." (Lewitt, 1967: 80)

From this, we can see LeWitt's dedication to a regimented and structured approach to creating artwork. Conveying his intentions and ideas to whoever views his work is difficult, because the concepts at the centre of the artwork cannot be easily deciphered without reading about it in a statement by the artist, for example. LeWitt aids the concept to be transferred to the viewer by relying on a neutrality within his work, to avoid any connotations or ambiguities which would otherwise distract from the conceptual nature of the work, he continues:

"...Colour, surface, texture and shape only emphasise the physical nature of the work. Anything that calls attention to the viewer in this physicality is a deterrent to our understanding of the idea and is used as an expressive device." (LeWitt, 1967: 80)

The artist sees these subjective, "expressive devices" as undermining the system that is used to create conceptual artwork which attempts to create a purely objective experience. "*Two Open Modular Cubes/Half-Off*" (fig.1) and the rest of his "open modular cube" series are prime examples of LeWitt's approach to conceptual artwork. In these works, LeWitt has used the recognisable, mathematical shape of a simple cube, and combined it with other cubes, often in repetition.



Figure 1. Sol LeWitt, *"Two Open Modular Cubes/Half-Off"*, 1972, 1600 x 3054 x 2330 mm, Enamelled aluminium, Tate collection.

"Half-Off" is simply two cubes joined together, with one being offset halfway on one side of the other cube. There is no hidden complexity to this work (Even the title explains what has transpired in order for the work to be created), and no "expressive devices" are to be found in the work. What this work attempts to be is the purest form of a system: The concept. The properties of the aluminium used to make it are lost underneath the neutral white of the cubes, which itself lends it to the surrounding "white cube" properties of a gallery. The size is not too big to be immersed by it, and not too small to warrant getting up close and personal with it, again the size is best termed as neutral, and "free from the effects of measured magnitude and sensually definable space." (Burnham, 1967: 147). This approach to creating artwork (conceptual art) was of special interest to art critic Jack Burnham, who highlighted the ever growing importance of mathematics and systematic data in art, and its relationship to technology. In relation to conceptual art, he compares art objects and the ideas that create them to a metaphorical "hardware" (art object) and "software" (concept). Burnham suggested that "conceptual art was all but devoid of the conventional materiality associated with art". (Shanken, 2002: 435) and by viewing LeWitt's work along with his minimalist contemporaries, one can see the ideas Burnham is alluding to with the software aspect of the work driving the hardware, and

so giving it a purpose or function, which is similar to LeWitt's comment that "The idea is the machine that makes the art" (LeWitt: 1967: 79).

Burnham's prediction was that art would become increasingly dependent on the systems and concepts that construct objects as our understanding of technology and mathematics increase. Post minimalism, the artist Mario Merz, incorporated the mathematical Fibonacci sequence as a fundamental concept in many of his artworks, such as "*Fibonacci Tables*" (fig. 2), which illustrates this system using not the minimalist neutral materials of LeWitt, but the traditional art materials of charcoal, paint and canvas, as well as the number from each step in the sequence presented in neon lighting, which Merz used for its ability to "transform raw matter" (Cooke, 1991: 65). This idea could be further applied in that the artwork itself has transformed a "raw system".

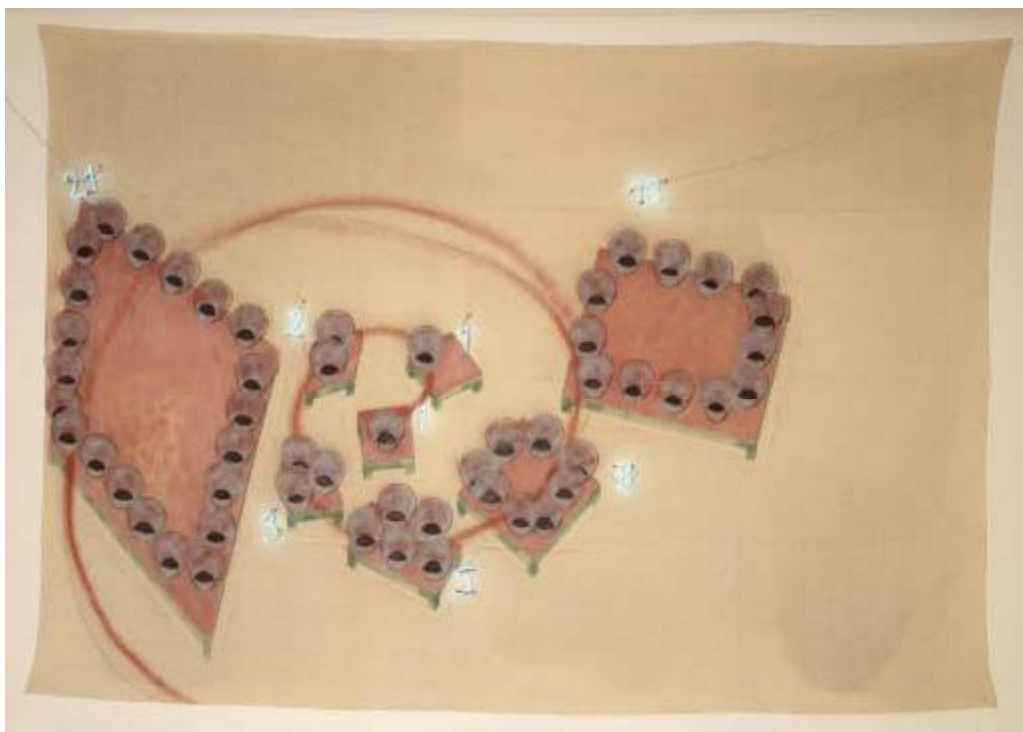


Figure 2. Mario Merz. "*Fibonacci Tables*". 1974. Charcoal, acrylic, metallic paint and neon on canvas. 2667 x 3822 mm. Tate Collection.

The sequence itself can be found in nature among the patterns of breeding rabbits, structure of pine cones, or in the case of fig.2, the shape of a snail's shell. Merz's approach to mathematical systems is focused on raising awareness of this sequence within a more organic context, using

these materials to illustrate the Fibonacci sequence with groups of objects drawn onto the canvas and its applications within the spiral shape reminiscent of a snail's shell. In relation to the theories of Burnham, this work is a very traditional artwork: a painted canvas attached to a wall, and by incorporating a system and concept into artwork such as this, there is an aspect of individuality and uniqueness, which deviates from Burnham's theory of "art objects" becoming more focused on industrial processes and replicas of the original artwork which would become a vehicle for the concepts they were based on.

A recent work by Tomas Saraceno also uses the concept of building structures using established mathematical systems, but using much more complex geometry and formulas. *"Galaxies Forming along Filaments, like Droplets along the Strands of a Spider's Web"* (fig. 3) is a large-scale installation composed of a large number of elastic ropes, which are interwoven to create a large geometrical marvel. This work is a departure from the objective work of LeWitt and the illustrative work of Merz, instead Saraceno has cloaked the mathematical systems in his work with subjectivity and representation, creating an engineering feat that captures the viewers imagination. Using complex geometry, an art object has been created that seems to offer a quiet reflection on the more beautiful and fleeting applications of mathematics and its relationship to natural forms. The black rope set against the white space evokes a sense of minimalism, yet the intricate design and complexity of the structure that has been created is anything but. The ropes are bound together to create spherical structures suspended throughout the gallery space, some high up, others barely off the ground. These complex, lattice-like constructions are reminiscent of astronomical objects or molecular structures found in biology, two concepts which contrast greatly in terms of scale, but relate rather agreeably in terms of structure. One reviewer has observed that Saraceno has...

"...Worked in collaboration with astrophysicists, architects, engineers and spider researchers...Saraceno's work looks to scientific study which uses the imagery and structure of spider webs to map the origin and structure of the universe. Referencing these studies, the sculptural pieces explore the delicate balance between ourselves and the earth." (Prime, 2010)

Within Saraceno's work, all these different areas of research are referenced in this utopian-inspired artwork. The artwork captures both the concepts of astronomy (Galaxies) and biology

(droplets), which are referenced in the title, similar to fig.1 and fig.2. Those who view this work will instantly relate to its immersive qualities by weaving under and over the ropes to move around the installation, and considering people's reactions and relationship to the utopian structures is an important aspect of Saraceno's statement as an artist.

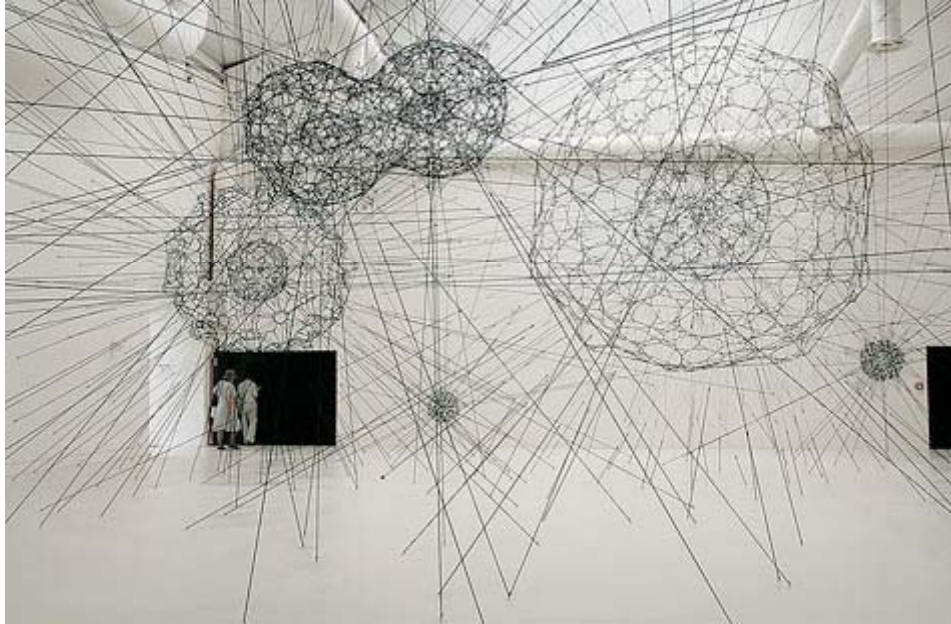


Figure 3. Tomas Saraceno. *“Galaxies Forming along Filaments, like Droplets along the Strands of a Spider’s Web”*. 2009. Installation, elastic ropes. Tanya Bonakdar Gallery, New York.

With his work, Saraceno has us looking to the future and how our knowledge of mathematics and technology will create a cleaner and harmonious future. Tom Morton offers the view that his work “illustrates not our proximity to a better future, but our distance from it.” (Morton, 2008:135), and in order to attain this utopia Saraceno has envisioned, he believes that first we must “...Challenge today’s political, social, cultural and military restrictions”. (Boeri, 2006). This shows his belief that the only thing holding back his architectural ideals are not the lack of understanding in terms of architecture and mathematics, but the lack of understanding and co-operation between certain groups of people (politicians, military forces etc.)

Order of nature

The mechanics of the natural world are often difficult to express in a simple formula. To define the shape of a landscape, or even predicting the weather is a complicated process involving a

number of factors. So at a glance, nature seems like a group of random events set in motion, and endlessly clashing against each other. The artist Robert Smithson embraces this chaotic system to create his artwork, focusing on appropriating the natural environment for his “land art”. Unlike his minimalist contemporaries such as Sol LeWitt (whom he was well acquainted with), whose work was constructed to seamlessly incorporate itself into the gallery space, Smithson often refuted the “institutionalised” conventions of museums and art galleries, he describes visiting one as:

“...Going from void to void. Hallways lead the viewer to things once called “pictures” and “statues”. Anachronisms hang and protrude from every angle. Themes without meaning press on the eye...Multifarious nothings permute into false windows (frames) that open up onto a variety of blanks...Museums are tombs, and it looks like everything is turning into a museum.” (Smithson, 1996: 42)

In spite of this, he has created work which is specifically purposed for these gallery spaces, which I will address later. Smithson called the artwork placed within these galleries “objects”, which he defined as:

“...The product of a thought; it doesn’t necessarily signify the existence of art. My view of art springs from a dialectical position that deals with whether something does or does not exist.” (Smithson, 1996:192)

The notion of art objects being products of thought aligns is similar to that of LeWitt and Burnham, but he then goes on to reject that these objects can actually be defined as art by themselves: Being placed in a gallery or museum, Smithson believes they are muted, and offer no dialogue, hence his interest in “Letting the terrain dictating the condition of the art.” (Smithson, 1996: 192). So instead of promoting mathematical “objects” and systems within the gallery, Smithson’s focus was placing them within the “site”: Places in the outside world which became the artwork themselves, “Where art is inseparable from it’s context.” (Tsai, 2004: 11). The only works that he produced for placement in galleries were his “Non-site” works such as “*Mirror and crushed shells*” (fig. 4), which merely act as samples and abstracts for specific sites Smithson has visited. Within this work, we see a pile of sand and shells collected by the artist from one of his sites, and displayed within a gallery space surrounded by the square mirrors.

Many of Smithson's works, both "site" and "non-site" use mirrors within them, because their reflective qualities again promote the question of existence and non-existence within the work, creating ambiguous space which reflects the environment (or in Smithson's case, lack thereof) they are placed in, and it is within elements like this that the concept of art is generated for Smithson.



Figure 5. Robert Smithson. *"Mirror And Crushed Shells"*. 1969. Mirror, sand and crushed shells. 90cm x 90cm x 90cm. Private collection.

The image of fig. 5 is instantly recognisable as a cube, contained within is this pile of sand, shells and shale, which although are the focus of the work, are disrupting the pristine geometric shape of which they are contained. The combination of mirrors also ends up creating more ambiguous geometric shapes in their reflections, the mirrors become more than just a container for the sand and shells placed on them, they become the base of a system that creates new shapes within the space, they also enlarge the pile of rubble within the work, and make it appear to be the centre of this strange space.

Smithson's most renowned work however, is one that is situated on the northern shore of the Great Salt Lake, Yutacan peninsula in Utah, entitled "*Spiral Jetty*" (fig.5). The spiral shape that Smithson has created protrudes out from the shore as an extension of the land, but the materials that were used to create it were specifically chosen by Smithson to make it seem like a natural occurrence within the site. The actual shape of the spiral is one that could almost be naturally formed in natural forms such as whirlpools and snail shell's, which I have already discussed with Mario Merz: The Fibonacci Sequence is the mathematical basis of the spiral, and so by translating this shape into part of the landscape, it creates a dialogue between the presence of this mathematical shape and the surroundings, which fulfils Smithson's intentions as an artist by raising this question of whether "Something does or does not exist." The Jetty is an extension of a natural system, but it's creation is more unnatural and is an intervention within the "site".



Figure 4. Robert Smithson. "*Spiral Jetty*". 1970. Mud, precipitated crystals, rocks and water. 1500ft. long x 15ft. Wide. Dia Art Foundation Collection .

To accompany "*Spiral Jetty*", a film entitled "*The Spiral Jetty*" was made as Smithson was building his most famous work. The video depicts a number of different aspects of the "Spiral

Jetty” work, for example the film shows just how the Spiral Jetty is made, with large trucks dumping tonnes of rocks into the lake, gradually translating into the spiral shape shown in fig. 5 and emphasising the scale of this project.

The film is a very important depiction of the Spiral Jetty, much more so than just still photographs. It offers yet another view of how the spiral has been translated into an artwork. The system of the spiral has not only been created, but integrated into it’s surrounding environment. Smithson often declared the importance of “Visiting and journeying to a site being part of the artwork” (Smithson, 1996: 41), but there is a great difficulty in actually visiting this site, shown in the film by driving night and day through a dirt road in a large jeep, so only the most dedicated would be able to view the real *Spiral Jetty*. The film therefore, is very important to experiencing the artwork in it’s original state as Smithson was creating it. LeWitt, who was a close friend of Smithson even commented that “...If he had lived, I think film would have been his medium.” (Amrhein, 2000: 33). The video artist Diana Thater participated in a talk about *Spiral Jetty* in 2002, in which she summarised her views:

“There is a Spiral Jetty that is a sculpture in Utah. There is as well a Spiral Jetty that is a film. Why should the Spiral Jetty be two things?[...]This film is not documentation. It is a work of art that employs the techniques of the filmmaker to create a subject: a thing which can transform[...]The Jetty can be the infinitesimal spiral of a salt crystal and then a galaxy spinning in space. **Just as water/time will eventually wear the Jetty down to nothing, film/time can turn the jetty into a galaxy.** This is the transformation that film can effect.” (Baker, 2005: 56)

The idea of looking at the film not as a documentary, but as part of the experience of *Spiral Jetty* allows the concept and process involved in bringing the artwork to fruition to become the focus of the work, so the spiral shape becomes not just a landmark, but an environment in which this mathematical system is exposed to a number of experiences and concepts are recorded. As the actual *Jetty* is exposed to the environment and erodes (As Smithson intended), the film will forever record the original concept and systematic shape of the spiral. This offers an important reference point to allow “sculpture *Jetty*” and “film *Jetty*” to be compared. Just as his “non-site” works (fig. 4, for example) are also different parts of the same work, one focused around this concept of a particular area or site and transforming it into artwork.

During different parts of the year, the jetty will change its appearance as well, when the water levels in the lake rise, the Jetty will become covered by the water. This process of submerging and re-emerging means the Spiral Jetty is forever changing shape. The spiral based on the mathematics of the Fibonacci Sequence is becoming affected by a number of real-world actions and events, and is continually changing and evolving, becoming an artwork which is much more than a pattern of numbers.

Diana Thater herself is an artist who uses video as her medium to create artwork associated with systems, but in contrast to Smithson, she aims to document and visualise certain systems in nature, primarily ones associated with animals and their behaviour. Her multi-video projection installation “Knots + Surfaces” (Figure 6.) at the Dia Centre for the Arts was inspired by a research paper that correlated the dance of a honeybee, which communicates the source of pollen to other bees, to the mapping of 6 dimensional space (The space of quantum fields).



Figure 6. Diana Thater. “Knots + Surfaces”. 2001. Multi-projector Installation. Dimensions

variable.

The purpose of Thater's work is to convey the idea of abstract space through her multi-layered projections. In order to construct a six dimensional space in a three dimensional room in "Knots + Surfaces", Thater employs a total of twenty four projectors all projecting something unique, ranging from swarms of dancing honeybees to hexagons of many different colours. The choice of the geometric hexagon in the installation is for two reasons: One is the hexagon is the most basic map of six dimensional space, and also that it is the shape used to construct the grid-like and modular structure of a beehive. The relationship between bees and hexagons is one that can easily be recognised, but relating them to the concept of six dimensional space would be a stretch for a viewer. But it is not necessary to understand the abstract mathematics that underpins "Knots + Surfaces" according to Thater, as she states in an interview with Melinda Barlow that "The work is not about honeybees or about mathematics but about meaning-making and image-making and ultimately about space." (Barlow, 2001: 35). In the same interview she talks about the use of honeybees as "...Models of other subjectivities which become the basis for artworks that are ultimately about the viewer/subject rethinking their own subjectivity." (Ibid.).

Thater's interest in creating artwork in such a subjective manner supports the comments she made about Smithson's "Spiral Jetty" (both object). Describing them as "...The infinitesimal spiral of a salt crystal and then a galaxy spinning in space." this renegotiation of just what the "Spiral Jetty" object is or could be is achieved through the "Spiral Jetty" film. Similarly, Thater's video installations transform the gallery space in which they are shown, the projected multi-coloured hexagons move around the gallery and highlight all the aspects of the space, as described by Melinda Barlow they:

"...Draw attention to spatial geometry and the way we frame the world perceive it. The diamond like patterns of sunlight on the floor, the rectangular elevator shaft on the north wall...Knots + Surfaces highlights and incorporates each of these related geometrical, spatial, and architectural elements." (Barlow, 2001: 36)

Along with the projection of the honeybees dancing in this mysterious six-dimensional pattern, the gallery becomes a more ambiguous space, constantly changing as these different projections overlap, or viewers walk in front of the projectors and become themselves part of

this ever changing space. From the “void” that Smithson describes galleries as, and used in works such as fig. 4, Thater has repurposed the space with a display of more natural and organic mathematics and systems. Whether inside the gallery or out, both of these artists have highlighted how the processes of nature have an order to them, and can aid in the understanding of more abstract and complex systems beyond the natural world around us as well.

Sounds of Systems

The combination of music and mathematics is one that existed for many centuries. One of the earliest examples of this is the Baroque-era musician and composer J.S. Bach, whose various canons were based on slightly altering a starting melody using a systematic approach to transform it into something new, yet somehow always resembled it's origin. Hofstadter suggests that they were:

“Posed as puzzles...A familiar game of the day to give a single theme, together with some more or less tricky hints, and to let the canon on that theme be “discovered” by someone else. “ (Hofstadter, 1979: 9).

Interpreting a system via listening to it offers a completely different experience than if one was looking at the sheet music for example. Altering a piece of music by ways of a numerical system makes Bach one of the earliest adopters of maths in art. Carsten Nicolai (Also known under his stage name, Alva Noto) is an example of a contemporary artist using new media such as sound to produce art and music. Nicolai has developed a practice based on the concept of both the psychological and physical effects of sound, and seeks “to overcome the separation of the sensual perceptions of man by making scientific phenomenon like sound and light frequencies perceivable for both eyes and ears.” (Folkert, 2009). These concepts are realised in work such as *Realistic* (fig. 7), which incorporates both the physicality and psychological properties of acoustics. From the exhibition catalogue in which *Realistic* was shown:

“...Sampled tones, modem beeps, and telephone pops and clicks are organised into loops to produce minimalist cycles of abstract sound. The result is a manifestation of the invisible energy of electricity: The acoustic trace of an intangible commodity.” (Bond, 1999:

104)

All of the sounds used are very inorganic and artificial. They are taken out of their everyday context as results of a technological process, and repurposed as a minimalist composition of sound. Viewers may recognise these sounds, but not the sequence in which they are set. Almost similar to Bach's hidden systems in his canons; Nicolai has set a challenge for the viewer to decipher these individual sounds and re-imagine their origin. The drawings mounted on the wall to accompany the sound offer one such translation of these sounds, as they are the physical workings of the sound by the artist, acting as notations for the sound compositions.



Figure 7. Carsten Nicolai. *Realistic*. 1999. Nagra 3 tape recorder, tape loop, dpa microphone, Neumann microphone-amplifier. 100x200x80cm. Galerie Eigen, Berlin.

The tape recorder and microphones set up in *Realistic* serve a purpose within the work as well. Their function is to record the concept of noise within the exhibition space. On this, Nicolai comments that "Noise is a complex, randomly organized signal that cannot be expressed in any

kind of algorithm” (Nicolai, 2008). The noise, however does become part of a system created by Nicolai; over time, the noise created in the gallery is recorded, and played back into the space with a slight delay, and after a set amount of time has passed, the process repeats itself, but this time the noise is recorded over the previous recording, thus as this process repeats itself a system is created that has effectively built itself: The looped sequences become indistinguishable from each other, and end up as not just background noise, but a dominating noise that sounds completely different from the original input to the system. With *Realistic*, we are listening to a system being created and evolving as it becomes increasingly complex by layering upon itself. Combined with the abstract sounds that Nicolai also included in this work, the viewer is offered a comparison: Those sounds which were composed and sequenced by the artist, and those that are created inconsequentially by themselves and those that come into proximity with the work.

The use of sound to translate mathematical logic into artwork differs from the work of the other artists I have discussed, primarily because these sound artists present their logic in a time-based context. Compared to the work of Thater, for example, who focuses on questioning our interpretation of space, Nicolai is instead addressing our perception of time; using the essence of sound and rhythm to accomplish this. But sound can affect what we actually perceive as well. The medical doctor and scientist Hans Jenny created “Cymatics” (fig. 8), a study of waves and vibration on physical matter.



Figure 8. Alexander Lauterwasser. *Cymatics With Pure Sine Waves*. 2002. Cornstarch and water solution.

The shape shown in fig. 8 for example, is one produced by the sound of pure sine waves being played through the cornstarch and water mixture. The vibrations and ripples are given physical form, and through this, a work of art is created. In using cymatics, Jenny is promoting the concept of sound being the mathematical catalyst which can transform physical substances in many different ways. Cymatics show us that this creative element of sound can be applied in many different ways, as Jeff Volk wrote:

“...Perhaps it depends on your ability to discern patterns, not just in the sand, but in the interplay of sound – the amazing principle of vibration, interacting with substance – the dense matter that gives form to these dynamic structures.” (Volk, 2007:13)

The concept of cymatics exists to offer a glimpse into the possibilities of sound as a driving force. Whether it is on a small, biological scale, or creating ripples on such a large scale that galaxies are formed, such connections I have already discussed in Robert Smithson’s work. The success of these systems and compositions of sound being depicted as art depends on the

ability to imagine their application in the context of these physical formations. The combination of sound and ordered systems offers a new context in which these systems can be exhibited. Whether composing a game of musical interpretation like Bach, or capturing the traces and tones of everyday life like Nicolai, these sounds are being transformed into a systematic composition that offers a reinterpretation of sounds and pacing, just like artists such as LeWitt or Thater offer a reinterpretation of space and its structure.

Conclusion

By analysing my chosen artists throughout this essay, I have highlighted the significance of mathematical, ordered systems within many different types of artwork. These artists choose to investigate and interpret these concepts to convey their intentions and provide a deeper understanding of the applications of these systems.

All these artists apply the idea of a system, but utilise them in many different ways. While LeWitt was so intent on removing anything deemed expressive from his work, Thater encourages subjectivity and questioning these systems. But as they are being exhibited as artwork, they become objects to be questioned and vehicles for their concepts to transfer to the viewer. This gives merit to the theories of Jack Burnham and his idea of concepts and formulas driving artwork, allowing mass production or replication of “art objects” to transport these ideas wherever the objects are exhibited. These mathematical systems as ideas and artwork open them up to ambiguity, allowing viewers to consider all their applications. As I have discussed in this essay, these include music by Nicolai and Bach, Biology by Merz, or astrophysics as shown by Saraceno or Jenny’s “Cymatics”.

On the question of using systems in artwork and role of the artist in creating it can be answered in their approach to using these controlled, ordered systems. The artists I have looked at take on the role of translating their chosen concepts into artwork and to highlight their possibilities. With Mario Merz for example, he has not created the formula of the Fibonacci sequence, nor does he have claimed to, but what he has created is a response, or a possibility of its use. The spiral shape has also been transformed into the *Spiral Jetty* by Smithson, offering yet another

interpretation of that mathematical system. Imagining and translating these shapes and formulas in new contexts is what links these works together. One could offer the interpretation that these artists are getting different results to the same formula; Once subject to the creative process of the artist, these systems do not offer one definitive answer, but rather they branch out in many different directions, offering a whole new range of possibilities for them.

Bibliography

Amrhein, Joe. Conley, Brian. 1997. *Robert Smithson: A Collection of Writings on Robert Smithson on the Occasion of the Installation of Dead Tree at Pierogi 2000*, exhibition cat. New York, Pierogi 2000.

Baker, George. 2005. *Robert Smithson: The Spiral Jetty*. U.S. University of California Press.

Barlow, Melinda. 2001. *Sculpture + Architecture in Dialogue: A Conversation with Diana Thater*. *Sculpture* vol. 20 no.8. pp 34-39.

Batchelor, David. 1997. *Minimalism*. London, Tate Gallery.

Boeri, Stefano. 2006. *Tomas Saraceno in conversation with Hans Ulrich Obrist and Stefano Boeri*. [Online resource accessed November 2010: <http://www.barbican.org.uk/artgallery/event-detail.asp?id=4107&pg=296>]

Bond, Anthony. 1999. *Trace*. Liverpool, Tate Gallery.

Burnham, Jack. 1967. *Beyond Modern Sculpture*. New York, George Braziller inc.

Cooke, Lynn. *Review: Mario Merz. The Guggenheim Museum*. *The Burlington Magazine*, Vol. 132, No. 1042, pp. 64-65

Dayal, Geeta. 2010. *Review: Carsten Nicolai*. *Frieze magazine*, Issue 132. pp. 196

Dossena, Tiziano Thomas. 2003. *Dia Beacon*. [Online resource accessed November 2010: http://www.dossena.org/tiziano/arte/arte_diabeacon.html]

Folkert. 2008. *There Can Be As Much Value In The Blink Of An Eye As In Months*. [Online resource accessed December 2010: <http://pichaus.com/gladwell-malcolm-installation-nicolai->

@d39450d54d6e2d72a984883b2ecee209/]

Hobbs, Robert. 1982. *Earthworks: Past & Present*. Art Journal vol.42, no.3. pp. 191-194

Hofstadter, Douglas. 1979. *Gödel, Escher, Bach: An Eternal Golden Braid*. London, Harvester Press.

Jones, Kristin. 2008 *Review: Tomas Saraceno*. Frieze Magazine, Issue 116, p. 248

LeWitt, Sol. 1967. *Paragraphs On Conceptual Art*. Artforum, June 1967. pp. 79-84

Morton, Tom. 2008. *Psycho Buildings*. London, Hayward Publishing.

Nicolai, Carsten. 2008. *Realistic*. [Online resource accessed December 2010:
<http://www.carstennicolai.de/?c=works&w=realistic>]

Prime, Richard. 2010. *Tomás Saraceno: 14 Billions*. [Online resource accessed November 2010: <http://www.coolhunting.com/culture/14-billion.php>]

Smithson, Robert. Tsai, Eugenie. 2004. *Robert Smithson*, U.S., University of California press.

Smithson, Robert. 1996. *Robert Smithson: The Collected Writings*. ed. Jack Flam. London, University of California press.

Shanken, Edward. 2002. *Art In The Information Age: Technology And Conceptual Art*. Leonardo 35 no.4 pp. 433-438

Thater, Diana. 2002. *Knots + Surfaces*, New York City, Enterprise press.

Volk, Jeff. 2007. *Cymatics: Insights Into the Invisible World of Sound*. Caduceus, issue 71. pp. 12-16.