BEHIND THE SCENES OF *QUARK*

IN CONVERSATION WITH EIJI SUMI

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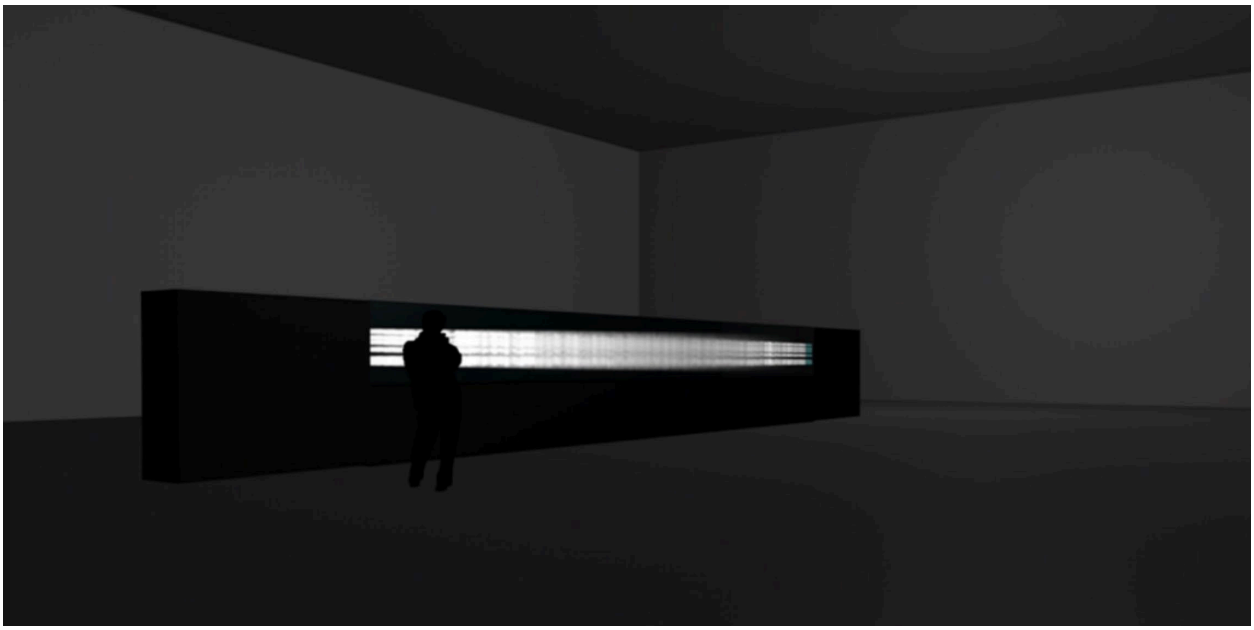
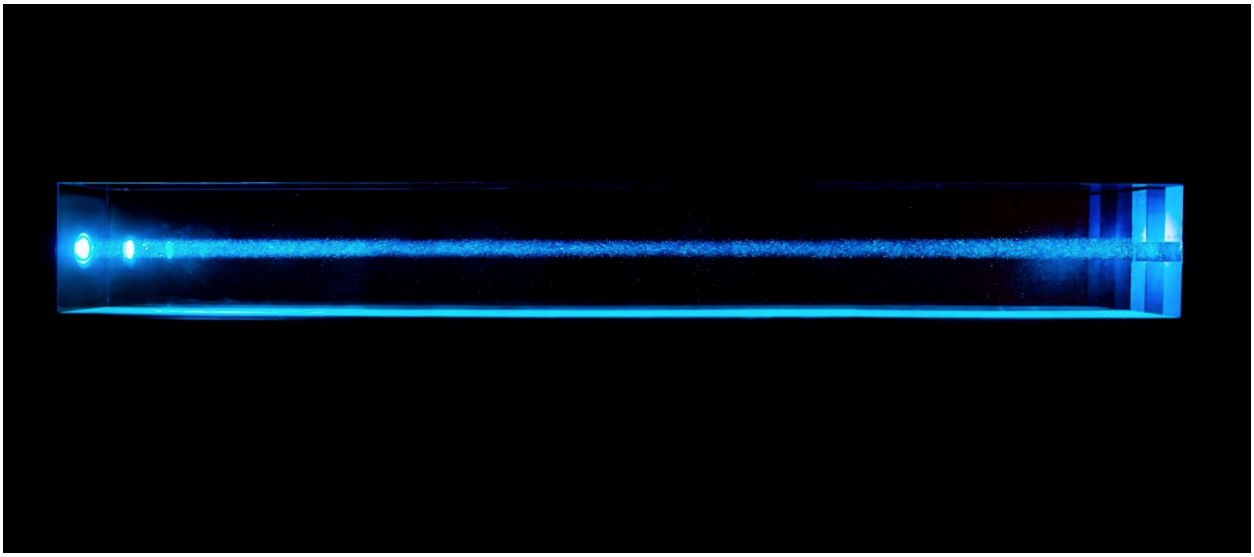
Interviewed by Alessandra Guarascio





Images courtesy of the artist

http://eijisumi.com/Quark-IV-1

AG: I am here with Eiji Sumi to talk about an open-ended installation series named 'Quark' and its evolution: *Quark* I, II, III, and IV. My first question is, what is the idea behind this work? Where did this idea materialize?

ES: As light is the one of the mediums, which I have been working with for a while, naturally I wanted to create an artwork with particles - since light is a particle (photon) and the flow of photons is a wave. My research on particles in quantum physics has made me decide to create installations, whose form is inspired by particle accelerometers - the systems that experiment with light refraction to visualize the enigma of current flow and imaginary Quantum mechanics collision. To be able to visualize this imaginary collision, I researched reflective materials in pigment form and found Mica powder, a highly reflective material that can float in the air for a long period of time.

AG: Indeed, seeing dust floating in the air has fascinated you for long as you say on *Quark IV*.

ES: Yes! There are gauges in the size of the powder and colors of the powder that create different types of refraction to create highly luminescent particle aesthetic. After I found highly this reflective powder, I researched how to float the powder in water and air with interesting aesthetic collision. In water, I found the magnetic stirrer system to create a vortex in the water as well as a fan blowing systems in the air. Other research has allowed me to create shoot beam lighting of the powder and influenced the design of the whole installation. Lastly, for sustainable function to endure longer exhibitions, I realized a system that feeds powder automatically through a combination of a powder feeding system, a belt conveying system and a blowing powder system.

AG: This information is very useful for those who maintain your work in the exhibition space. And talking about space…What is the most important first impression that the work should make? What should happen between the viewer and the work every time it is presented?

ES: Quark surprises, mesmerizes and creates wonders, fascination, inspiration and imagination. Art works are supposed to give these impressions to the people. This happens continuously through the sequence of different patterns and configurations that inspire visualization of different types of collisions by particle accelerometers as they seek new particles.

AG: It is quite obvious that the effect of the artwork has a lot to do with the experience. Is this why the equipment is not visible to the public? What are the most important visual aspects of this work if we think this way?

ES: The equipment is not visible so that the Viewer can concentrate and focus on the proposed aesthetic of the work, rather than making the audience feel the sense of reality. Taking the viewer out of reality is the favored factor of my general art practice. Also, I believe hiding equipment will give the audience mysterious factors to wonder and to question how and why this work exists. Finally, proposing imaginary quantum collide aesthetics will not fit with showing the normal electronic components.

AG: And I can say that imagination is really the effect while contemplating it. What are the most important characteristics?

ES: Creating an environment and new configuration that nature itself does not show and which is normally invisible to us. In the Quantum level, we are not capable to see things with our eyes. I am using techniques and systems to generate a new configuration. otherwise we are not capable to see natural resources such as wind, water turbulence and magnetic force. This is a similar approach that quantum physicists seek for new things, as for me, by using accessible materials as a visual artist.

AG: Is there any intangible element like sound or movement that you consider decisive?

ES: Intangible elements include nature's fluidity and uncontrollable elements - but many of the intangible elements are decisive and controlled by me to create collisional aesthetic. By testing many experiments in the process, I have taken in account elements that can create intangible elements, including wind's value, time, size, scale, locations, lighting color, brightness, shape, form and movement. Sound is more of a complimentary element to stimulate senses, inspiring the visualization of quantum collisions in every single level. Also, planet's sound and sound of the universe were inspirational for the creation with sound designers. Hertz effect was also considered and applied to the work.

AG: Let's talk about the work as a whole now. How do the components relate?

ES: Each component relies on each other's component's function, and if there is a missing link of components or components in failure, the whole will not create fine result.

AG: Can you please explain the process?

ES: Ok, First I want to explain the process of feeding the powder within the tank.
To be sustainable for long exhibition periods, I had to create a machine that will feed the powder automatically and regularly. So, I came up with the idea of automatic powder feeder.

The powder feeder has two functions, which are related to the blender and the screw feeder.
The first function is represented by the blending function to stir powder, which avoids bridging or creating air pockets within the powder stock and carries powder into a hole of screw feeder.

The design of a proper powder blending system was a challenging process since this reflective powder was very light and it was easy to create the air pocket. I researched how food industry uses blending systems. After which I created my own feeding machine system to feed the powder into a screw feeder tube by using technical method of aluminum bending by laser cut.

The second function is the screw feeder, which carries the powder within the long tube and brings the powder to the cart area. This system was also inspired by the food industry's powder feeder. What I found difficult about this process was the limitation of the space in regards to the height and specific locations to position the screw feeder and it's tube, since otherwise the side fan would not properly blow the powder in the air or create a great effect.

Also, I needed to find the proper pipe radius, length and screw drill bit. The tube pipe needed to be a plastic tube that doesn't create metal friction sound. I had to find a screw bid that doesn't cut and eat soft plastic materials and fits perfectly in the plastic tube, neither too big nor too small. First, I tried to create

my own screw bit, but the cost was too high so I kept researching ready-made screw bit and finally found the drill bit for concrete that doesn't have sharp cutting edge. But this screw bit had less space to carry powder and struggled to feed properly in the beginning. Later, I found the speed of the proper RPM (Rotation Per Minutes) can successfully bring powder whole through the tube. The speed of screw feeder had to be not too slow and not too fast. For this adjustment, I added an analogue motor driver with hand knob to control the speed. I considered controlling the speed by programming the Arduino for this speed at one point, but it was more convenient to have flexibility with a knob to control speed manually. Later, during the exhibition this hand knob also could control the volume of the powder manually, and it was very convenient to have that.

One thing to note is that I later found out that a museum technician changed the exact location of the knob adjustment, which was marked as it was not feeding powder properly. Also, the museum stuff could not notice the machine was not feeding powder correctly since it looked like it was working well at first sight, because the system was blowing up powder by recycling it from floor. So, this knob control is quite important and sensitive to properly run the installation. Additionally, I realized it takes a while at the beginning to feed powder since the tube need to be filled in with powder so that powder is pushed over to the edge and drops into the cart.

As a next step, the cart needs to pick-up the reflective powder at the cart's designated home location. For this function I had used the belt conveying system so that the cart could move back and forth within a large glass container after picking up the powder. To be able to do so, we added a switch at home location.

This way every sequence within the powder feeding system, Arduino knows that the cart is properly located at home and can feed powder.

After the cart picks up the powder the powder is blow up in the air. The fan systems, which are located at the cart will blow this powder by a programmed time-based sequence, moving back and forth within the glass tank. I added two different types of fans with different function, side fans (direction of the wind goes horizontally to the side) with two on one side of the cart and two on the another one and a top fan (direction of the wind goes vertically to go up) for a total of eleven fans.

To be specific, two side fans will blow the powder from the original location (where powder feeder drops the powder) and another two fans will blow on a counter effect of the wind so that powder will be in the center location of the cart.

Then, all eleven fans composing the top fan system will blow up the powder in the air, which was previously blown from the side fans, bringing all the powder up and creating collisional visual effect. Also, these fans will blow up the powder, which was sunk on the glass tank floor. This function ultimately recycles the powder within the tank. In this way we can decrease the amount of the powder to feed (this also helps cleaning and avoid accumulating too much powder in the tank), but additionally, this system will generate full feeding of blowing the powder in the air through the whole tank even when there is no powder on the cart. To add this function a whole design of belt conveyor system was developed.

To be able to recycle the powder from the inner floor I first added a down fan that will blow down strongly so that it will clean up the floor and the up fan, if close enough to the floor, is strong enough to carry up

the powder to the air from the floor. So, I lowered the cart height and attached the fan which is strong enough to carry up the powder from the floor.

With all the new function and system, I could give my work more freedom to create new sequences of visual effect.

The first version of Quark IV was exhibited at The Art Center Chulalongkorn University. In that occasion, the powder was fed manually without any mechanics. Because the length of the new exhibition at Art and Science Museum in Singapore was more than four and a half months, I developed a mechanical and automatic powder feeding system and recycling powder system.

Lastly, Ray of beam lighting sequence with different shapes and colors spot this blown powder and finally create the result of the visual aesthetic. Without shooting these beam lights, powder is invisible enough for our eyes. I originally used flash-light for a small version of the installation, which is Quark I. The Installation size was around 1m and 50cm, while Quark IV was 7m in total. Quark I 's flash-light was transformed from battery operated to DC electronic system so that it will not face battery power outage. For Quark IV, I used Moving Head Beam Light, which is controlled by DMX controller. By using Moving Head Beam light, I could change the color of the light and shape of the beam by changing DMX Value from 0-255.

- *Changing color value from 0-255 such as white, red, blue, purple, pink, amber, etc.*
- *Changing focus value from 0-255 such as size of beam and shape of the beam, 2 color gobo, etc.*
- *Changing Gobo value from 0-255 such as crossing, middle rage circle, small range circle.*

Lighting sequence and pattern was created with the combination of the above DMX value.

Scene of moving head light sequences

**Creating Bi Concave beam effect by using Gobo and having focus point in the center of the glass tank by using focus value. Color Chosen was White and Red (Powder No Feed/Fan partially blown).*

**Creating flat beam effect by using Gobo, by having vertical flat beam light, it captures movement of the particle in particular amount and create dynamic movement of the particle. Color Chosen was Blue, Pink (Powder Fed/Fan partially Blown) and Red (Powder No Feed/Fan blown whole through the tank).*

**Creating fat dense cylinder shape beam by using Gobo – Creating dense particle effect. Color Red (Powder Partially fed/Fan partially Fed). For this sequence, fan was blown only at home location, and reflected powder light was slowing moving towards the other side of the glass tank due to the heat created by moving head light.*

I would like to mention that the powder in the air within the glass tank always moves from one side of the tank to the other, where there is strong heat from moving head light is located.

**Creating mid-range radius cylinder beam by using Gobo – It was intended to show the brightest and intense sequence of visual effect. Color chosen was White (Powder No Feed/Fan blown whole through the tank)*

** Creating very small radius cylinder beam by using Gobo and focus. It was intended to create image of very small collision. Pink color (Powder Fed/ Fan partially blown)*

**Creating Two color beam effect by using Gobo and by using focus value. Color Amber +Blue/ Yellow + Red (Powder No Feed/Fan not blown).*

The entire sequence was about 25minutes loop. And each sequence represents different type of collisions.

AG: Which Technical issues did you encounter along the way? Can you please explain how did you deal with them?

ES: I actually encountered quite a few issues with the moving-head light, which selection represents one of the most important factors. The model is, indeed, determined, by the stability of the piece. This component moves up and down and rotates around when you start up as a start-up function. I found some of the moving-head light didn't come back to the original location after starting it up. 0.5cm off from the original location, for example after start-up. So, when I shopped for the moving-head light, I myself needed to go to the shop and make sure I could find the necessary model by testing that light focus will come back to the original programmed location after shutting down and restarting. I found later that moving-head light sometime changes and does not come back to the original location; which I concluded it is mechanical bug. That is why I had to manually fix the position of the light by moving the light itself.
This is the very important part for conservation to find a machine that will come back to the original location accurately since for most theatre or concert usage, people will not require the accuracy that Quark IV requires.

Stand-alone DMX Device

DMX is normally controlled by ready-made DMX controller. Quark IV requires the situation with stand-alone. Original DMX controller was created to control the moving headlight and controlled by Arduino. It is important to note that any of disfunction of each component will fail the fine result.

AG: What is the core aspect of the work?

ES: Science and art, revealing invisible, nature's new configuration. Quantum Physics. Law of the Universe. Stunning beauty of Illuminated moving particles.

AG: What are the margins within which changes or modifications can be considered acceptable in your view?

ES: Modification of sequence time of programmed scene (Shortening entire scene from 25 min to less) and component's upgrade and its housing's design (e.g. Powder feeder's motors upgrade-from DC motor to Step motor considering longevity) are possible. Changes to the glass tank design for effective cleaning and conservatory purpose are also planned (e.g. creating retractable pocket windows - 4 locations on the top of the 7m glass tank).

Glass cleaning is one of the most important parts of maintenance to show Quark IV. Since it contains very light reflective powder it is natural that powder itself deposits on the glass surface. To avoid powder deposit, I used anti dust nano coating and, on the top of it, I used anti-static spray to clean the glass with micro-fiber fabric on the internal surface. Although all the effort, powder dust still accumulates on the glass surface. To clean a long sealed glass tank, I also used magnetic window cleaner with long strings attached, but I only made one retractable pocket ceiling window. Glass tank should contain more than one pocket window on the top of the tank. Four windows would be appropriate to make the cleaning process more sustainable and functional during weekly maintenance.

AG: It is very valuable that you recognize that improvements can be made and facilitate the work of museum personnel. I am sure that better results can be achieved having better access to the internal parts of the case. But how do you see your role in decisions regarding the future of this work and its preservation? What values will you attribute to it?

ES: There can be new functions, such as sucking air functions for visual purpose (gravitational) and cleaning purposes. For instance, nano coating technology's dust free glass surface can be developed further with scientist.

Also, working with CERN or any other scientific institution to have interdisciplinary approach to exhibition and working with the institution to reach a wider range of audience is possible. Also, to try to let the institution owner conserve the work using proper preservation strategies.

AG: Can you please guide us through the production history of the work?

ES: I did create the first version of Quark in 2014 with dimensions 140H X 50L x 40W cm. There was no robotic powder feeder nor rail cart system and spot beam lighting. You could see Quark I as a smaller scale of Quark IV.

Quark II did follow the first version in the same year with the addition of water turbulence flow with powder floating system by magnetic stirrer system and projection lighting. It was approximately 75cm height with a glass tube of 40cm diameter.

In the same year, I did also create Quark III, which had a water turbulence powder floating system by magnetic stirrer system and laser lighting. The glass tank was rectangle and measurement of the tank was 50cm Height X 20cm Length x 20 cm width.

In 2016, I created Quark IV for the first time in the Art Center Chulalongkorn University. It was on display for a period of one month and half. In this case, it did consist of an air powder float system with fan blowing. There was no robotic powder feeder nor rail cart system. Scale was slightly different from 2018 version of Quark IV in height and Width. Length of 7 meter was the same.

Quark IV 2014 had used 3 glasses joint, total length of 7 meter.
Quark IV 2018 had used 2 glasses joint, total length of 7 meter.

In 2018, Art and Science Museum, Singapore commissioned Quark IV for an exhibition of four and half months. I did upgrade the system with an air powder float system and fan blowing, robotic powder feeder

plus Cart Rail System. A corresponding linking system with light, powder feeder, cart and fan were included.

AG. Let's talk about documentation and conservation! As you know the software and hardware are consumer level and not designed to last forever. What software, hardware and processing equipment are specifically used in this production? Do you currently consider them stable? And did you plan for spare equipment? Did you always maintain them?

ES: Software and programming of the micro device which controls kinetic machines and lighting were used and programmed by the Arduino, which is an open source hardware and software considered relatively stable. Mechanical Component designs were produced with a 3D program called solid works. The powder feeder and cart was made by metal bending technique with laser cut in solid works. So, all the machines were able to be designed in custom size.

Ready-made equipment which I had bought and used were conveyor rails and it's wheel and stand, which was attached to the custom designed cart. This rail often was used for the parts of making 3d printer so that rail movement was accurate. Also, approximate 13-meter conveyor belt was ready made. We had prepared and built spare parts for sensitive equipment such as micro device for entire programming and laser cut metal sheets for powder feeder and extra fan cart. It was kept in the back room as spare, but no whole part's spare was assembled.

AG: It may be possible to remake the work in a new technology without losing its original character (emulation). What is your attitude towards the aging and the replacement of playback equipment?

ES: Technology will continue developing and it will replace equipment in the future at some point.
It is important as an artist to keep technical rider and record Programmed codes, sequence notes with effect and values. Every system's equipment technical drawing, need to be kept in order to be able to transfer the programmed sequence into new equipment and system. Even though equipment wouldn't change, concern still remain since every programmer writes code differently and another programmer may not necessarily understand other programmer's coding. So, it is important to take all the record of the time, base sequence in the note, as well as filling conservatory questionnaire like this one, so that any case of retrospective purposes, technical rider will play the role.

AG: The traditional concepts of 'authenticity' and 'the original' have a different emphasis in time-based media art. What is your definition of authenticity and what is your approach about the deterioration of the work?

ES: Getting authenticity in some form of digital art installation can be challenging especially when artists are not present in the exhibition space, it is bit like restaurant's taste deterioration without original chef's appearance. Over time, something very particular and very important in the intention of artist's creation can deteriorate by the maintenance people's own decision. There may also be defect of work not being noticed nor properly repaired or adjusted. For audience, it can be like eating food in the restaurant and in reality, it is slightly different from the original and authentic taste, but the audience has no way to detect the difference.

It is frustrating for artists not to be able to keep this authenticity. To be able to keep artwork authenticity to its best conditions, artists need to develop the best of communication tools and technical riders as our own challenge and may require team's inspection.

I assume that artist such as Anish Kapoor or Olafur Eliasson, who owns bigger team and systematic technical riders are capable to keep this authenticity.

AG: What is your view about conservation of digital works?

ES: My earlier digital installation works used to be demolished after the exhibitions and no consideration for conservation was made. Recent works have considered conservation during the process of creating the works and I plan for conservation. So, work is planned to be dissembled and reassembled efficiently with purpose sizes and so on as well as considering logistics in size. Yet some work of some parts faces to be demolished due to the location of the assembling the work and cost of shipping; In that case, keeping technical rider organized in file is important solutions.

AG: Do you believe it is possible to maintain the original formats when the functional characteristic of the work is loss?

ES: It will be difficult if the original format of work was kept by artist privately, especially when the artist is no longer available. If the artwork was collected by an institution with technical riders, it has better possibility to be maintained characteristic of the work with detail technical riders.

To keep original formats (authenticity, micro devices, programming) is difficult to be maintained although characteristic of the work can be regained by new technology. Difficulty is how new programmers or micro device creators can decode the original from technical riders and recreates it. One of the best methods to help understanding technical rider is to record entire installation on video. This way, museum technicians can know what effect of sequence needs to be re-produced without the artist's presence.

AG: The functioning of digital art – how it 'exists' – often depends on sensitive technology (ephemeral). What is your view regarding the obsolescence of display equipment?

ES: Technology will change, and it may stop functioning with original equipment.
It is difficult to maintain original format, yet characteristic of the work can be regained by new technology with detailed technical riders with function note (value, programming code, technical drawings, etc.). New technology often has solutions to retrieve old systems. Again, detail technical riders are keen element for conservation of digital art.

AG: What importance do you assign to original technological components? Can they be of secondary importance to its functioning as a whole?

ES: A full set of technical riders with written explanation of detailed functions can result in the original technological components being of secondary importance in theory. This sort of full sets of technical riders is not common practices for emerging artists. I believe it is more often accustomed for artist whose work has been collected in the institutions, to create such a full set of technical riders.

AG: This is all for now and I guess we will speak again the next time you have more ideas for the next future of Quark. Thanks for all!