

Looking through glass: An exploration of contemporary tools and techniques.

Name: Sophia Henry

Student Number: 1902385

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The future of glass is very bright; technology is constantly adapting and expanding the glass community's resources, creativity is at an all-time high. In order to explore the future of glass as an art form, I will be looking at how glass has changed through the work of three contemporary glass makers and how they have developed new artistic glass techniques. While investigating what materials and tools can be used to create a whole new form of glass appreciation for the future generations, I will explore the work of Artronauts, Rui Sasaki and Rachel Phillips. I will suggest ways in which their approaches will affect future generations of artists. I will also be detailing my own explorations of these new methods and techniques and how I have gathered a deeper understanding, not just of the actual techniques, but of the artists use of these.

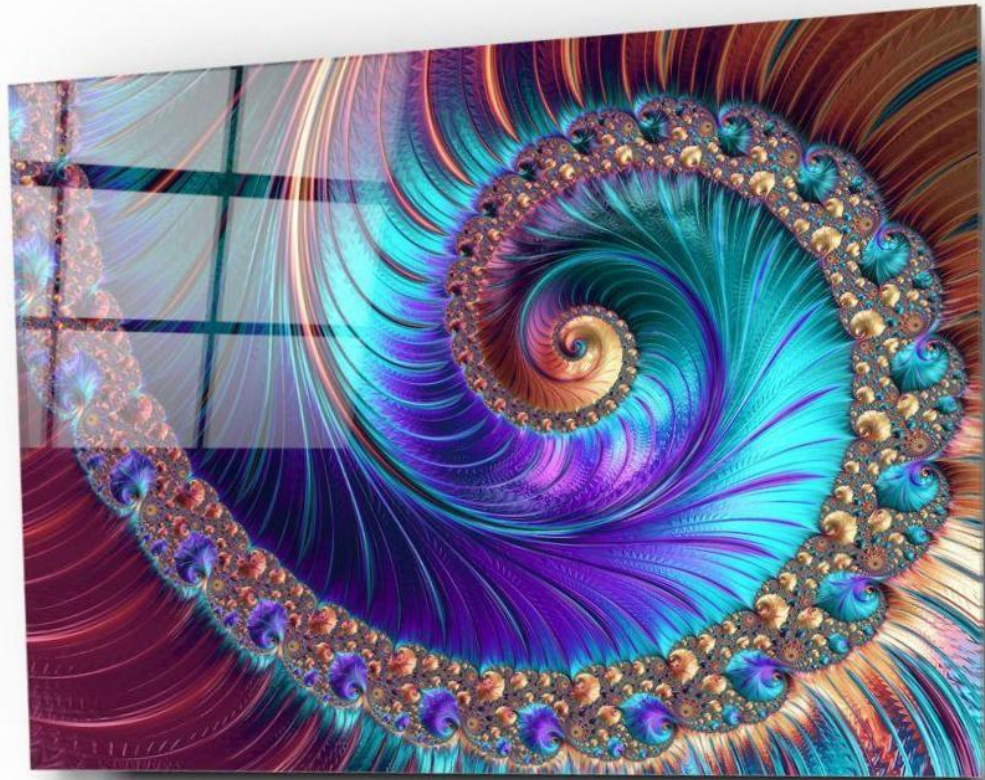


Figure 1 Glass UV printing wall art ARTRONAUTS

The Artronauts are a team of two brothers from London who created their own brand in 2020 to sell their artworks directly to the public. They make custom pieces and Ultraviolet (UV) prints (this process will be explored in depth below) and very large sculptures. The aim of Artronauts is to make things around us that look everyday turn into something fun and to “create the best living space” (Artronauts, 2021, p. 1). They have an Instagram account where they try to connect more with their customers and they do reply to questions and inquiries about the artwork they produce (@artronauts).

The brothers welcome everyone to be a part of this with them. Starting a “war against boredom by using all possibilities, they destroyed what seemed simple and built new ideas about how artwork can be viewed” (artronauts, 2021, p. 1). They had a drive and determination to create pieces for the home that change how collectors experience colour. Colour is found in many places and can affect moods and behaviour and “enhance memory abilities and functional ability” (Kurt, Osueke, 2014, p. 1). Colour is very important “it is a ubiquitous feature of the visual environment” (Allen, 1978, p. 1) affecting moods and emotions should be a key focus when decorating interiors. There is also a vast literature on colour theory which should be taken into consideration with the meaning behind colours (Kurt, Osueke, Itten). Using colours or patterns in art and positioning objects within the home is used to bring out positive emotions within the viewer. “Colours are forces, radiant energies that affect us positively or negatively. Whether we are aware of it or not. The artists in stained glass use colours to create a supramundane, mystical atmosphere which would transport the mediations of the worshiper to a spiritual plane”. (Itten, 1970, p. 12).

This piece is a very good representation of new modern technique that has been incorporated and blended into a glass art piece. This artist has been able to create a digital print using the

world's highest quality *Durst* UV printing and this has the longest fade resistance. The two brothers use only the best quality inks and machinery (*Durst* UV printing machine). This is an interesting method of directly UV printing onto the surface of the glass. This method can be used to print any image, even family photos saved for generations instead of having the actual photo dull and fade with age.

This may be a simple concept but it will make an impact. This has been inspired by Laser Photo Crystals which are images that have been engraved on a Crystal which are usually 2D, this however has no colour at all in the image unlike the UV printing technique which makes it very unique and original. This method really does show “The elegance of the glass surface” (Artronauts, 2020, P. 1) the gleam of the glass brings out the colour and offers a sense of elevation to the overall piece, a normal canvas “is traditionally woven from 100% pure Flax (linen), 100% pure cotton, 100% pure jute, a mix of linen and cotton or a mix of linen and jute” (Pinchetti, 2016, p. 1). Creating a canvas is a long process and while still makes a good surface to use as a base for your work. UV printing onto glass is the next step.

The Artronauts create their digital UV printing by using a mixture of traditional organic inks and ultraviolet light which is then used to dry or to cure the surface of the glass that has the design or image printed onto it. The process of this is quick as glass is placed within a large-scale digital printer and the ink is directly printed onto the surface, like curing resin, you have to “cure” which means to set this layer so it will stay on the glass and not just be wiped off. This is done using UV lights for around 10 minutes. This method is a much faster and is an inexpensive way to create beautiful and vivid high quality custom prints that can go onto any surface. The only problems that have been noted is that it does not have a very high durability to scratches and the inks could fade slightly over time. However, this is a very innovative and allows you to create many different design ideas and images.

UV printing was created by Michel Caza in 1990's and Benny Landa was the one who created digital printing in 1993 his invention was called the E-Print 1000 and it was the world first digital colour printing press and still to this day he is known as the father of digital printing. In 1971 Benny invented Electrolnk he created his company called Indigo where he sold this product to the public, it was during this time he made the E-Print 1000, during an interview Benny said “we have 500 scientist and engineers continuously Working on Nano technology to better our world” (Landa, 2020) this is how they discovered Nano pigments, which is used in his printing press and digital printing. It had a large impact on many industries, such as packaging, art, textiles and glass. Digital printing is still being improved using different materials to print on and exploring the limitations.

UV lights are made by electric currents going through a gas, like “vaporized mercury. This is an electromagnetic reaction. UV light comes from the sun but in the art world, it is essential in evaluating all forms of artwork for condition and age” (Carney, 1974, p. 1). The use of UV light as a final step to cure an image onto glass is a new function.

The art of using UV light to cure printing inks has made an impact because the “ability to fully dry the ink during the print process enabling the substrate/product to proceed to the next part of the conversion. In addition, key advantages of UV curing provide product enhancing features, such as surface protection and gloss finishes. It can also be employed for laminating,

tactile finishes, screen ink finishes and many other versatile print processes where UV can immediately cure and finish the process.” (Fleotechmag, 2021, p. 1)

The creators of our past have really paved the way for our future, because this is where it started and all it took was an idea. These methods from previous inventors have been redeveloped and explored upon by many companies and artist such as the Artronauts who have been using these techniques in their own artwork. The use of these beautifully rich colours has been taken full advantage of during the manipulation of materials and designing of these images, paintings, photos and even drawings.

The following case studies show a range of new methods and techniques crated by Rui Sasaki and Rachel Phillips. Discovering any accomplishments, what has inspired them though out and where these new glass art methods could be further expanded upon. Finding information about chemical reactions and comparing phenomenon’s that have a similar effect to Rui’s work. As well as looking into how Rachel has explored her techniques. Finally looking into how they have been able to create these pieces, discovering how these artists have been able to inspire the future generation of glass makers.

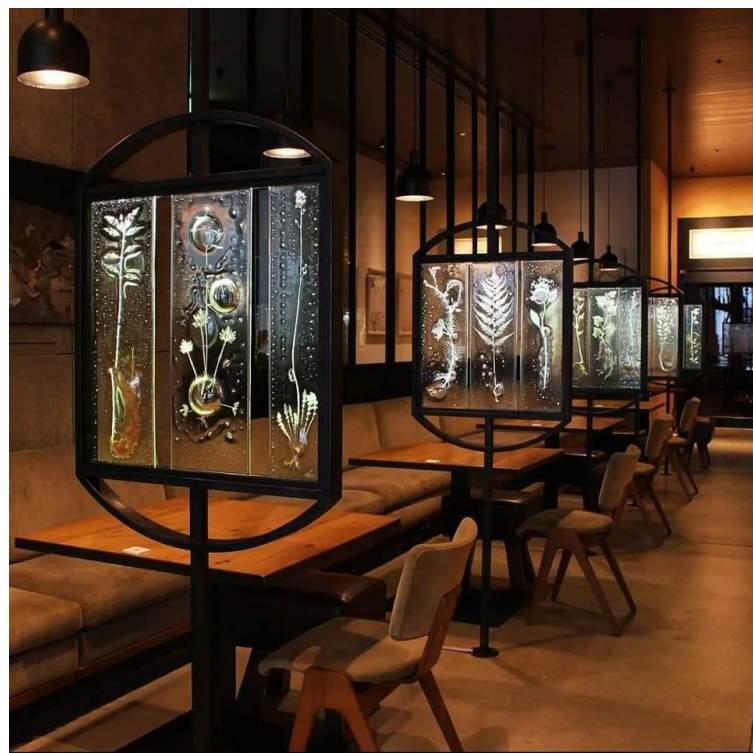


Figure 2 Restaurant Commission Rui Sasaki

Rui Sasaki’s work creates a whole new world, which she describes as intimate and very delicate (as show in Figure 1). The meaning behind these pieces relate to her home, a bond with herself and its surroundings. In a Vogue (2021) interview that Sasaki gave on 30th June,

Rui says that “collecting plants is her self-medication to mind a connection between herself and where she is using all her five senses” (Vogue Singapore, 2021) so the use of glass is a way to preserve her surroundings. In a way glass has been able to capture the very presences and familiarity of that place.

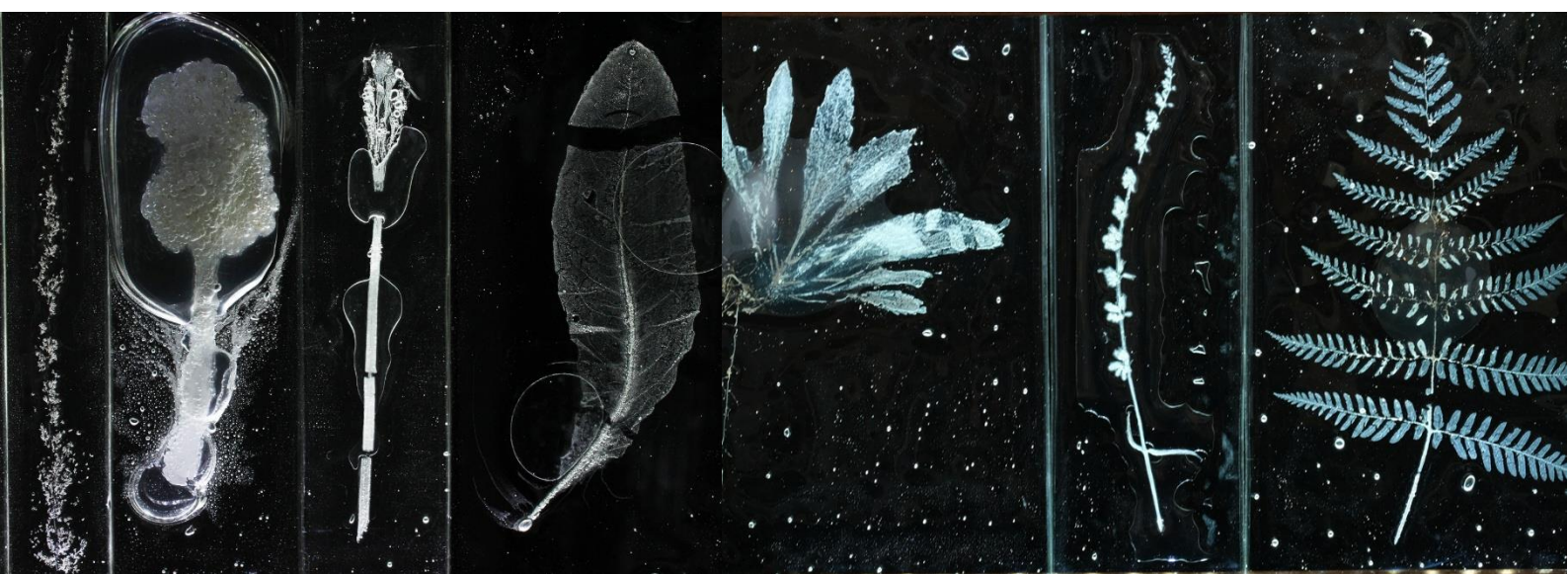


Figure 3 Ash memories Rui Sasaki

Rui became an artist because she was looking for the meaning behind what she could see, Rui was looking for answers. Water is very important, she wished to make something out of water and she found glass as her medium of choice. Rui is a concept artist and must have a bond within the creation of her pieces or she loses interest and is unable to finish; there must be a drive.

One of Rui’s key drives is to observe the weather. Cloudy and raining, sun and windy all of this she is very effected by, the weather affects her mood and her spirit, and Rui wants to change the perspective that people have of rain and bring joy as she appreciates the rain, this is one of the elements she tries to bring into her work. “This is an expression of living in harmony with nature” (Wasara, 2008 p. 3) this demonstrates a Japanese sensibility.

According to the Japan Times (2020), Japanese glass art is very young and is developing constantly but has a strong presence, this is because western culture has become more accepted in Japan and has started to inspire, influence the younger generation and this has been shown by the amount of “glass artists that have absorbed western techniques and taken them in a markedly different direction, giving form to a distinctly Japanese sensibility” (Japan Times, 2020). Japanese art really does try and push the boundaries, while another portion of that community try to make pieces that have a function. Rui has used her art work to portray a whole other meaning as has found that glass is a tool for her to express herself, something to experiment and explore. Rui believes glass is not “tided to the land so it is free with bond so to her it has unlimited parental” (Zhao, 2021, p. 1). Evidence of the influence of nature on glass is everywhere and does not just belong to one place, the material itself is very malleable and has unlimited potential. Her pieces and installations are used as an expression, Rui considers the entire process as a continued part of her work and the glass is the concept.

Rui moved to the United States from Japan, this was the time when Rui started to forget her home back in Japan. She states that “home is the place she can feel intimacy” (Sasaki, 2020, p. 1). This is what she is trying to find again through her art, her path of discovery. It was eight years till she went back home to Japan. It was only then that Rui has discovered that she has lost her “intimacy” of Japan. It raised questions about what is physical space and what that means to her. Noticing that through out Rui’s work she has documented the meaning of intimacy and her memories of home, her work continues to develop going forward, she will find a greater understanding and the answers that she is missing. Rui is trying to grasp the feeling that she has forgotten, reconnect with lost memories, in a way how Rui has created these pieces are reminiscent of a time capsule. Memories are like “artifacts and in our lives are both ephemeral and eternal many will disappear without a trace, and others will live onwards for many millennia’s” (Oravec, 2004, p. 736). So, the use of a time capsule even one made of glass taken into a more artistic way is very similar in nature. “A time capsule initiative for positives is generally designed to preserve and store traces and memories of peoples culture for the next generation” (Oravec, 2004, p. 15) which brings back the idea of Rui trying to find her home in her work as she is finding her culture, finding herself.



Figure 4 “Liquid Sunshine/I am a Pluviophile,” a commission for the Corning Museum of Glass in New York

Rui uses phosphorescent lights with solarium light in her work so when light is removed from the area surrounding her work the actual pieces glow similar to that of glow worms. When looking into the type of phosphorescent that could be used to replicate this, there are many different powders and pigments that cause chemical reactions in a similar manner. Many tests need to be done to know more about this new technique. As the reaction to the chemicals is unknown in some cases, it is important to keep health and safety in mind when using these materials.

Rui considers her work interactive and ever changing, and has discovered that weather is something that has a powerful meaning to her, Rui feels that weather affects everyone both mentally and physically so the idea for the viewer is that you will see the changes in the glow which is bringing forth an appreciation of natural light changing though out the day given how “natural light is vital to health, our daily rhythm and getting a good night’s sleep” (The Guardian, 2019), this adds another reason behind why Rui feels the need to create an appreciation to nature in its many forms.

Each organic material that was used to burn between the glass has been taken from places Rui has been. Rui had developed an emotional attachment towards. Rui describes intimacy; how she remembers her childhood though smell and touch of the plants that she chooses; how she finds memories is though all her senses as explained in a previous paragraph.

Rui then dries the plants, cuts circles of sheet glass placing the plants between, places them into the kiln. Each plant has a different moisture so she constantly checks the kiln over the time. Sometimes holding the kiln at 30 hours or sometimes as little as 20 minutes as the higher the temperature the softer the glass will be allowing it to form and manipulate easier in the kiln (Brandy, 2021 p. 48), Rui’s aim is to achieve the white ash, black ash could be considered, connected to death or gloom, in terms of weather, storms come to mind bringing destructions while also being beautiful, lighting also producing “ the most eye-catching, and dangerous, lighting strikes the ground” (Weather wise, 2017, p. 1). With some pieces Rui will glass blow a petri dish, cut down the side so only a rim is left along the edges, she does this so water can be poured into the space. Glass records memories and preserves which is why glass has been the perfect material for her to use.

The use of strontium aluminate europium dysprosium which is a luminescent compound, this is a possibility that allows her to makes her glass work glow in the dark. This is a safer way to create a similar effect to Uranium glass seen in figure 12. Rui uses this compound combining it with silver, or other pigments to create the blue effect. This then bonds to her glass while it is still in its melted form. Once this has been though the kiln and left to cool, it should be able to “charge” in the sun and glow in darkness.

This is a chemical reaction linked towards the type of glass Rui could be using and the different compounds. “Photosensitivity In some glass containing small amounts of cerium oxide and ions of copper, silver, or gold, ultraviolet radiation exposure causes the cerium oxidation and reduction of the other elements to their metallic states. With subsequent heat, the metal nuclei grow (or “strike”), developing strong colours (red for copper and gold, yellow for silver) in the ultraviolet-exposed regions of the glass”, (Corning Museum of Glass, 2016, P. 1) this allows for numerous possible chemical reactions once you start to combine the glass with other oxides or organic matter. This technique has been used to produce three-dimensional photographs. Silver, copper and sulphur in the kiln causes a “chemical reaction that will cause a range of colours and effects in the glass” (Foster, 2012, P. 1).

Recreating Rui’s work will be a challenge as there are many different elements to consider, the aim is to find organic materials that can be used to form a connection like Rui has with the organic material.

Being able to appreciate what the world has to offer is important considering all the events concerning climate change, so this could have an impact on the viewer allowing them to

really think about the world around them and the impacts that they have had on the world. Memories that are lost are like the burning of the plant, they are forgotten like the black ash but then they come back to life and have been reborn into glass transforming into the white ash being sealed safely forever. This is a very powerful meaning as you are capturing the very essence of the plant you are using to bring the memory to life, it is symbolic in many different ways, this is something to use going forward within my own work.

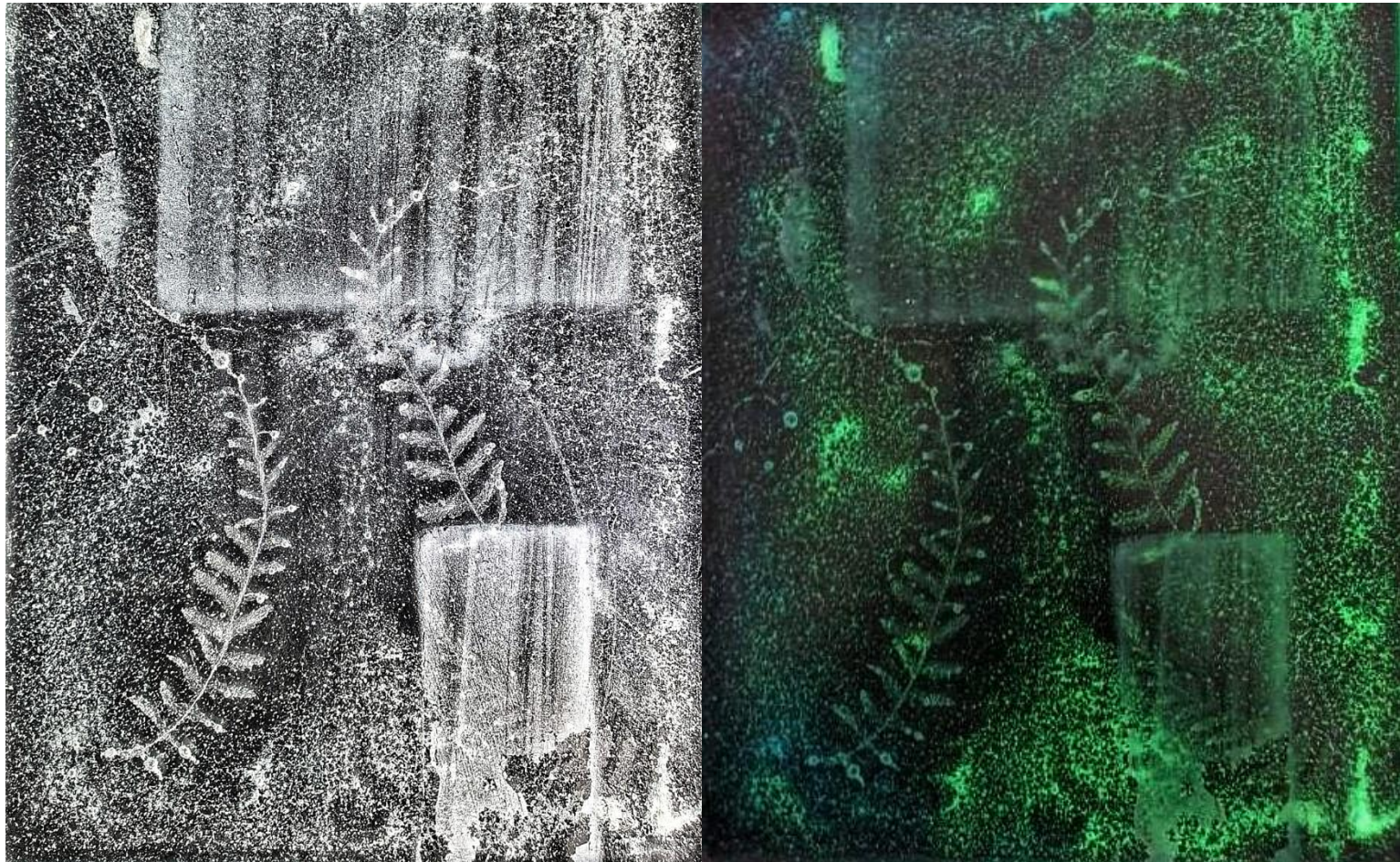


Figure 5 My own work

Creating these pieces were a challenge, every kiln is very different from each other this means you will always get different results and using this method allowed me to understand problems that happened, the kiln wash which did transfer over slightly in a few places on the back of the glass, this will be simple to remove using a Dremel or some sandpaper and polish for a final effect. Using plants that have been pressed in a book, placed them between two pieces of glass, using a mixture of pigments and silver to try and create something that would have a chemical reaction similar to Rui's glow work. The works created resembles the glowing of a cave filled with glow worms, a very beautiful glow that shifts and changes colour and intensity as time goes on, the glow does not last very long but does create a similar feeling within myself when seeing the Aurora Borealis.

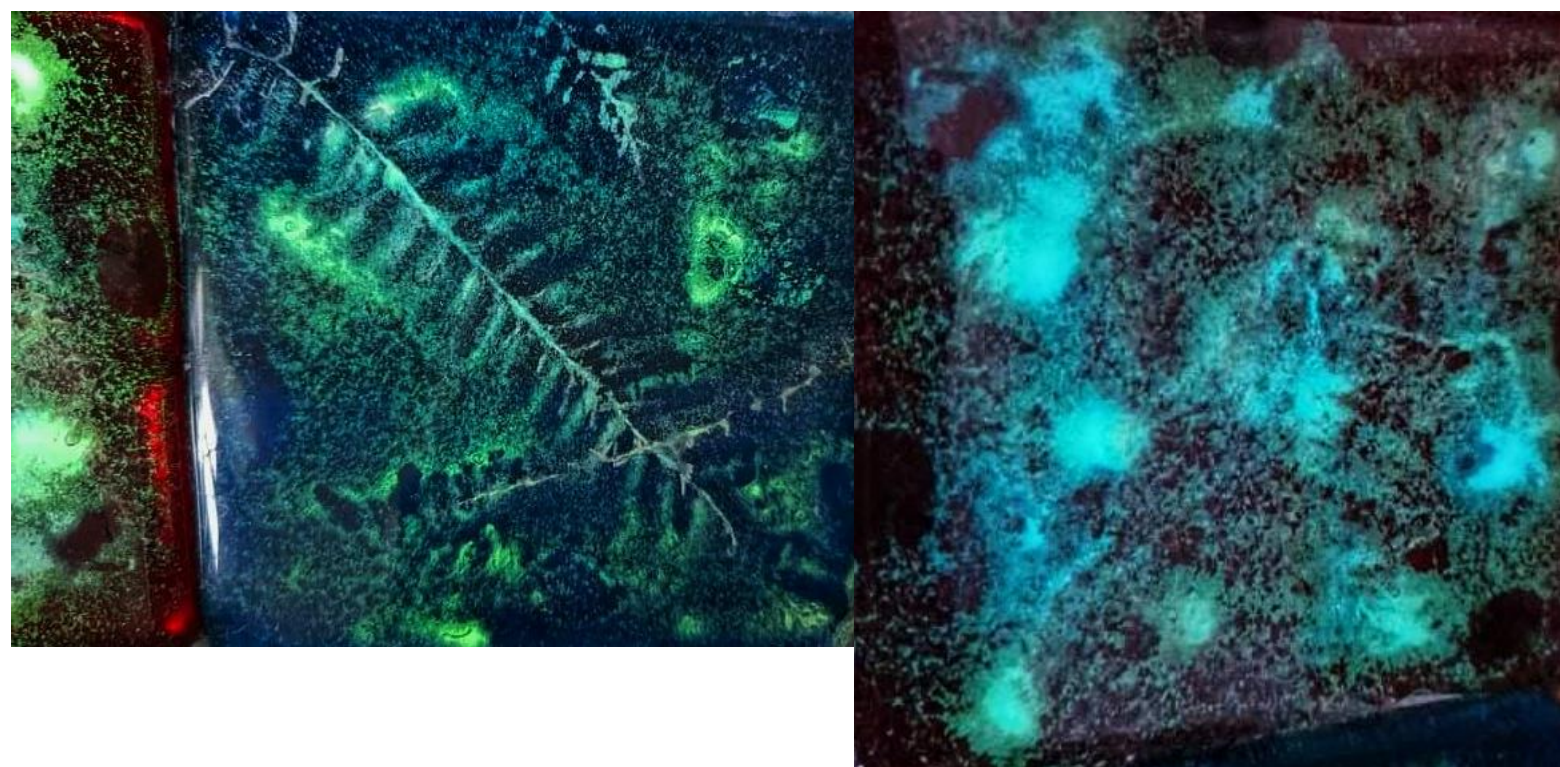


Figure 6 My own creations.

While trying out these methods, it was easy to find a way that expressed myself in a similar way to Rui, from the organic material being taken from places that I have a connection with as well as the lights of the compounds used. This is a new way to find yourself within glass.



Figure 7 Reisa fjorden, Norway bathing in auroras. 2014 Tor-Ivar Næss.



Figure 8 Aurora over Mt. Hood in Oregon as captured by Ben Coffman

Everyone is very attracted to glowing lights and looking into why these phenomenon's happened, why this is so eye-catching could be explained starting at the aurora borealis and Aurora Australis, "The colours in the aurora were also a source of mystery throughout human history. science states that different gases in Earth's atmosphere give off different colours when they are excited. Oxygen gives off the green colour of the aurora, for example. Nitrogen causes blue or red colours" (Eleanor Imister, 2017, p. 1) It used to be said that the Aurora was spirit of animals and the souls of fallen people who had left this earth.



Figure 9 Waitomo Glow Worm Caves in New Zealand. Credit: [2il.org](https://www.2il.org/) via Flickr/[CC BY 2.0](https://creativecommons.org/licenses/by/2.0/)



Figure 10 Usadadanuki Japan Fireflys



Figure 11 Bioluminescent algae Lee McGrath

Fireflies and glow worms, “these creatures have a remarkable presence of yellow- pigmented cells, yellow fluorescence and yellow bioluminescence in the parapodia” (Gouveneaux, 2016, p. 398) these cells and others for example the common blue emitting system and red emitting system causes this pigment transfer of luminescent energy this is called a Bioluminescence resonance energy transfer which is the effect that we can see.

Bioluminescent algae or glowing plankton can be seen in many places, even in Wales, seen in a few different places such as Southern down beach in Bridgend and Pobbles Beach in the Gower. The scientific word for this is called *Noctiluca scintillans* and this is an “unarmoured, marine, planktonic dinoflagellate. It is a non-photosynthetic heterotrophic and phagotrophic species and is actually colourless, a large number of food vacuoles can be found within the cytoplasm this type of species actually feeds on phytoplankton, detritus, protozoans, fish eggs and copepods. Now how these blooms into beautiful lights are actually by accumulation of the buoyant cells on the surface of the sea that colour the water in bright pinkish reds or oranges and blues” (Umani, 2004, P. 545) it is the reaction in the cells, the food it consumes allows the *Noctiluca scintillans* to bloom this is a similar thought to flamingos as the feathers

are actually white but change to a vibrant pink this can only be done with a certain diet of beta carotene found in algae, larvae and brine shrimp.

ELVES which mean Emissions of light at very low frequency perturbations caused by electromagnetic pulses which form a glowing ring of lights which can be seen raised above thunderstorms. Red sprites which are created when lightning strikes the ground this then causes an electric field acting as a conductor to form lighting antennae, “they can 50 kilometres tall by 50 kilometres wide these sprites belong to a mysterious and colourful group of phenomena called Transient Luminous Events, or TLEs. Other TLE’s include halos, Elves, trolls, secondary jets, Blue starters, Blue jets and the magnificent gigantic jets.” (Hank, Smith, 2019)

Air glows is another natural accruing light, these are located at the outer ring of Earth’s atmosphere and when molecules in the upper atmosphere reacts with the sun’s rays this creates a ball of light which can be seen from Earth, “There are three types of airglow: dayglow, twilightglow and nightglow. Each is the result of sunlight interacting with the molecules in our atmosphere, but they have their own special way of forming” (The conversation, 2016). Lighting has always been able to attract attention, when the sharp cracks of lightning strike in the sky this is caused from a storm that contains water and ice shards and once this collides together creating a charge, this charges up and zips through the currents in the clouds causing the flashes of lighting, it is important to note “Lightning is extremely hot—a flash can heat the air around it to temperatures five times hotter than the sun’s surface. This heat causes surrounding air to rapidly expand and vibrate, which creates the peeling thunder we hear a short time after seeing a lightning flash” (National Geographic 2021).

Another point to make is that even fish who reside at a very deep depth within the ocean eventually become see-through and have been known to develop the ability to glow in the dark, this is called Deep-sea fish bioluminescence which a very interesting factor. “Bioluminescent organs evolved at least 27 times in teleosts, and known bacterial bioluminescesce organ in fishes include a folded epithelial chamber made from the alimentary tract or the epidermis organs derided from the oesophagus” (Ghedotti, 2019, p. 1540) it is a very complex development that has occurred in many different sea creatures for one reason or another.



Figure 12 Vaseline and Uranium Glass (ca. 1930s) ORAU Museum of Radiation and Radioactivity

A thought of how lights can draw our attention is an interesting thought because, while there has been study's on how we see lights and how that effects our eyes not much is knows about the pull towards this subject, personally the lights caused by these mystical phenomenon's and even the glow of the glass created by Rui as well as canary glass, uranium glass, or Vaseline glass because these all have a similar effect as all of these natural occurring lights, all of these were made using Uranium, which is an extremely dangerous chemical and radioactive material. The reason why people are drawn to all of these glowing lights is because it feels spiritual and otherworldly.

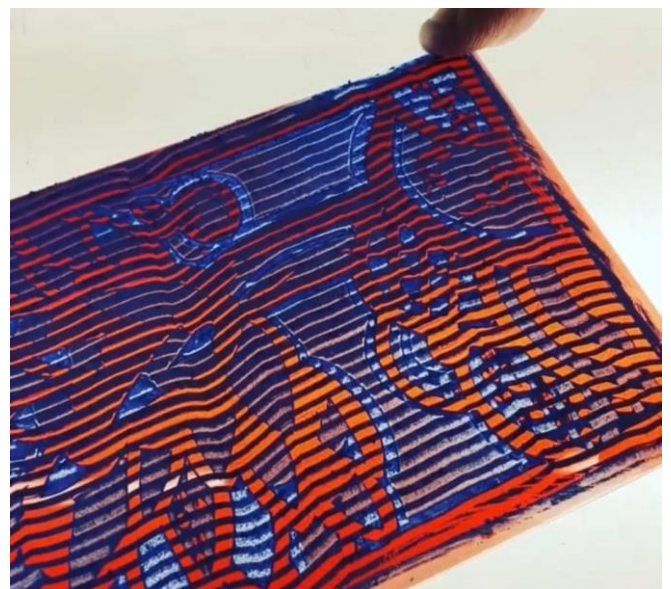


Figure 13 Embroidery inspired glass painting

Rachel Phillips is a glass artist who works and lives in Preseli Hills of West Wales. Phillips's chose glass for its unmatched power of light and colour. Glass is an incredible medium to work with and admire. Rachel designs and makes architectural glass for many different places such as castles, churches, public places, private properties and even does restoration work. She has a few different styles to the way she works using techniques such as traditional stained-glass painting, staining and etching (Phillips, 2010).

In 2016 Phillips and her creative partner Lina Norris created a studio together called Studio Melyn this was done in an attempt to join forces from an "increasing body of collaborative projects" (Phillips, 2010).

Phillips gave a 3-week lecture in traditional stained-glass techniques at Swansea University of Wales Trinity St David and this was in 2019 when she taught me. She showed many of her painting tricks that she had developed over the years. She is a member of the Centre of Applied Glass Research at UWTSD but has more recently been focused on her own commissions shown in Fig. 13 (above). She has a deep fondness for medieval glass painting and uses this in all her work but in a more modern and updated fashion a really impressive example of this is her work at Resound window for the Church of St Michael and All Angels, Blewbury, Oxfordshire which was made in 2018 this can be seen in Figure 8.

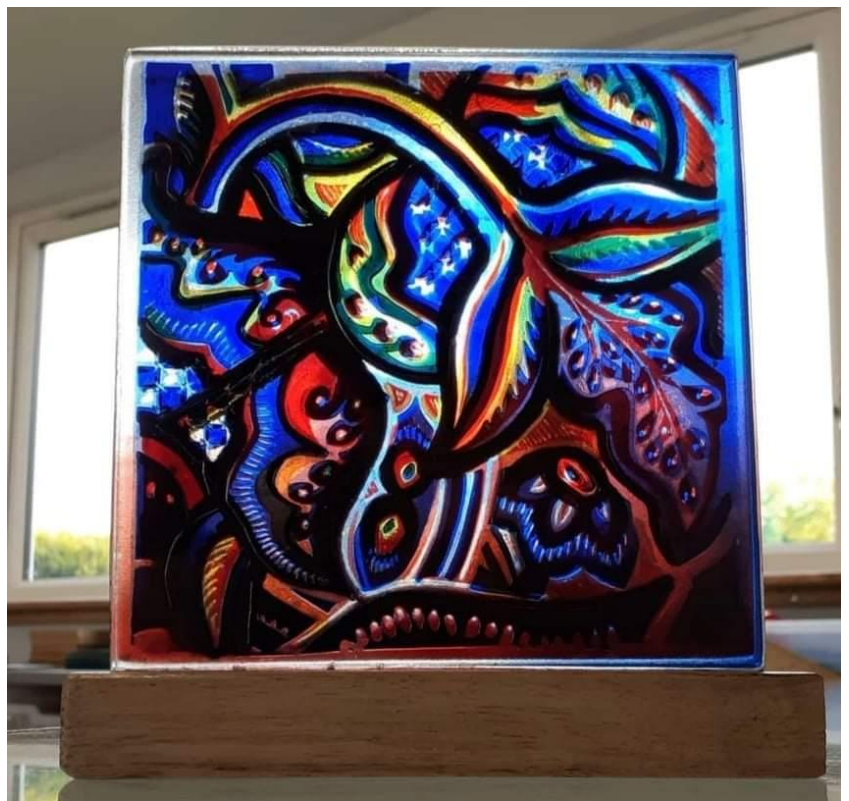
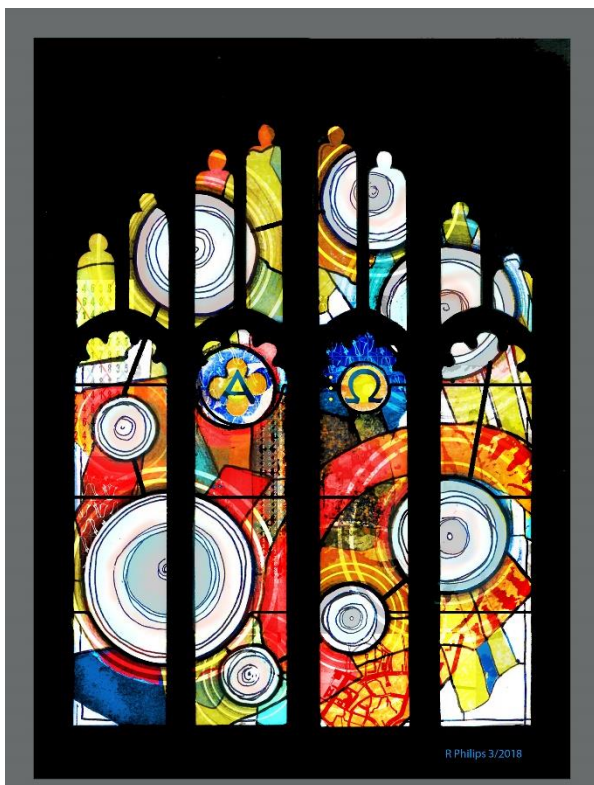


Figure 14 Resound window for the Church of St Michael and All Angels, Blewbury, Oxfordshire 2018

All her work shows a great understanding of the use of colour and the impact that it can have, and all the shapes, curves and lines seem to create a hypnotic effect as if you are getting lost within the glass, Thomas van Leeuwen a scholar once said that "you look too long at glass and you can see anything you need to see" (Eskilson, 1964, p. 5) this is a very true statement

many people fall into the gaze of coloured light and the material of glass itself and what it can do.

Glass is a very flexible “A material that is neither liquid nor solid, glass is amorphous, hovering between the two states. In a near-magical process, ordinary sand is transformed into a fragile, see-through material (Aki Ishida.Blurred, 2020, p. 26). This works in Philips favour because of the methods that she has created, one in particular comes to mind is Philips Dremel work, this is when she takes a hand Dremel and draws designs on the surface of the glass slowly carving inwards. This worked really well with all different kinds of glass as seen through out her work however Philips does use a primarily flash glass for her work, Flash glass is a type of the glass that has a base colour of glass such as red and then another layer of glass over top such as green, now there are many different mixtures of colours so the possibilities of how you can use and manipulate this type of glass is endless.

Flash glass is used to create stunning effects because it allows you to remove layers of glass in different ways making gradients or to reveal a separate colour of glass beneath, this is done using methods that Philips likes to use, such as sand blasting and Dremel work. Philips will also use enamel onto her pieces to add even more colours to the overall piece or she uses normal paint work. All these methods can be done to create ethereal pieces of art. During the workshop that was held in the Alex building within university Philips showed us how she does a fire polish to create a similar effect as an acid polish, this was a perfect way to get the glass to show a glow from within and really highlights every depth of the glass that was carved away.

A lot of Philips work has been painted first onto coloured glass, using enamel or tracing black pigment, Philips will matt the entire surface of the glass first allowing that to dry afterwards going back in with a pointed tool such as a porcupine quill or a barbeque stuck to remove some of that pigment creating detail and designs within the surface of the glass, her next step, once it has gone through the kiln and been fired she can go back in over the top adding a different level of colour and depth to the entire piece. Philips can then goes in with the Dremel and carves into the glass revealing all the colours used or to add more detail and dimension.



Figure 15 My Samples

All of these methods take time and patience, using her methods, together and individually as to really understand her methods. The Dremel work took the longest but really made an

impact within the glass, creates a beautiful effect that stands out on its own. This could really make an impact on the glass community as it's something very different, usually if you want to carve out a design into glass you would either sandblast the glass through a design you cut out of fablon, stuck to the glass or you would acid etch your design through fablon. So, this is a very innovative and new method that can defiantly stand out and grab your attention. This will be a really useful method for the future as it is a lot quicker method compared to the other techniques that create similar results and most importantly you have more control over the Dremel then you could use the sandblaster or during acid etching.

Looking over what has been discussed about these artists, they all have one thing in common and that is they are not afraid of change or to create an impact. They are bringing glass up to date and showing that there are endless possibilities moving forward. They will inspire many future glass artists to push themselves and let creativity take over. The artists Artronauts, Rui Sasaki and Rachel Phillips all have very individual art styles and while all using glass as the base material, they have all been able to create something new. In the future, glass artists will learn from people like this and find new creative ways to express themselves building a new appreciation for glass as a medium.

What has been discussed about these individual artists started at looking into who they are as artists, their history, how they have evolved over time to get to where they are now, seeing what they have accomplished from manipulation of technology, creating chemical reactions in the kiln, to layering techniques to reveal something beautiful. All of this and more will inspire the next generation of contemporary glass artists, the glass community learns and expands from seeing current artists such as these breaking the mould of glass and pushing limits. Going forward this should help to broaden any glass artist horizon and allow anyone interested in glass as an art form to get a new understanding and appreciation of the subject.

The methods and techniques that these artists use could be expanded upon in a few ways such as creating a raised glass design for UV printing as this would allow for more depth. The luminescent and ash work could be formed to create larger sculptures or made into functional objects such as a vases, bowls or even complete dinner sets. The Dremel work could be improved upon by not just using it as detail work but applying it to create the entire design.

Future uses of glass, domestic environment examples are glass wash basins, glass Forcett's, 3D glass mirrors, not just being used for glass lighting. possibilities are endless when considering this medium. Industrial uses such as glass bridges which are already being utilised in some countries, glass garden installations are just two examples that could be explored in the future.

Technology is pushing the boundaries of glass as we know it. The highlighted artists as well as future artists using this medium will directly affects the future glass creators giving them new opportunities to find their voice within glass.

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Figure 8 Aurora over Mt. Hood in Oregon as captured by Ben Coffman

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