

~2 signifies ‘about two’ or ‘about to’. The project promotes the concept of a co-dependent relationship through using light as a material that connects people intuitively. It is a poetic interaction whereby air blown by two people is transferred to a 'living-space' lighting-source. A series of glass artefacts capture the movement of blowing, and the project represents a dialogue between art, design and craft.



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This work is the result of an integrated learning-experience combining the theoretical- and practical-knowledge I have gained from the past 4 years. I position myself as a context-driven designer, in that I am concerned with contextual narratives and critical value beyond functions. My process starts with a critical insight or a narrative, which then drives the concept throughout the project. As a critical designer, I have always believed in the middle-ground between marketing solutions and critical aspirations, which is normally regarded as an impossible fusion. Thus, in my final year design project, fundamentally, I am trying to blur the boundaries between the critical design and commercial design.

Background:

Designer



Yifu Liu (1997), born in Beijing, China. Currently graduating from Product design in University of Edinburgh before attending the Royal College of Art and Imperial College London for postgraduate studies.

This project is an investigation into the future of human relationships. The goal is to offer an alternative solution for reflection on, and analysis of, the topic of the growing normalisation of co-dependent relationships in technology applications. The project incorporates knowledge from philosophy, technology, design and crafts, in order to transform intangible theories into a tangible solution. By reconnecting modern-day humans to our ancestors' reverence of light, ~2 invites people to explore technologies through togetherness, rather than seeing the interaction as limitation. ~2 is a series of interactive lighting-objects that can only be used in a shared situation, which transfer the air blown by users into lighting. The name ~2 stands for 'about to' (an action that will happen soon, bringing us back to the present moment), and 'about two' (which relates to the purpose of this design in connecting people). In addition, "~" matches the waves format and, "~2" is a universal sign that can be understood in any language.

Introduction:

Looking back to look forward





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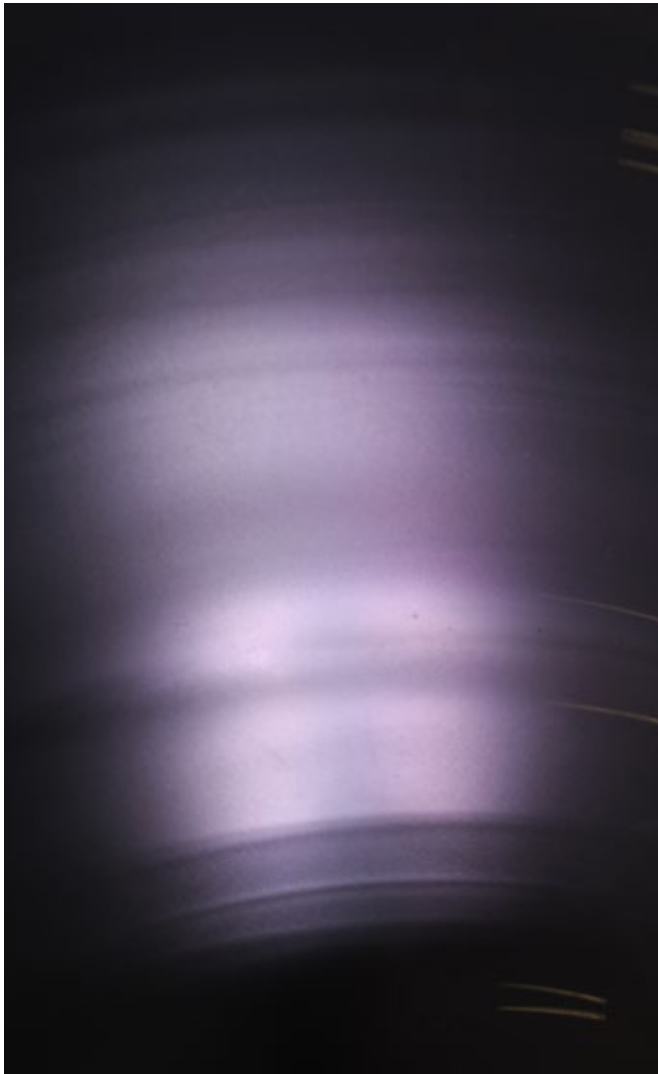
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It is a poetic interaction whereby air blown by two people is transferred to a 'living-space' lighting-source.

1, 2, 3

~2 home photo collection, 2019

By reconnecting modern-day humans to our ancestors' reverence of light, ~2 invites people to explore technologies through togetherness and co-dependent relationships.



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4. 5

~2 home photo collection, 2019



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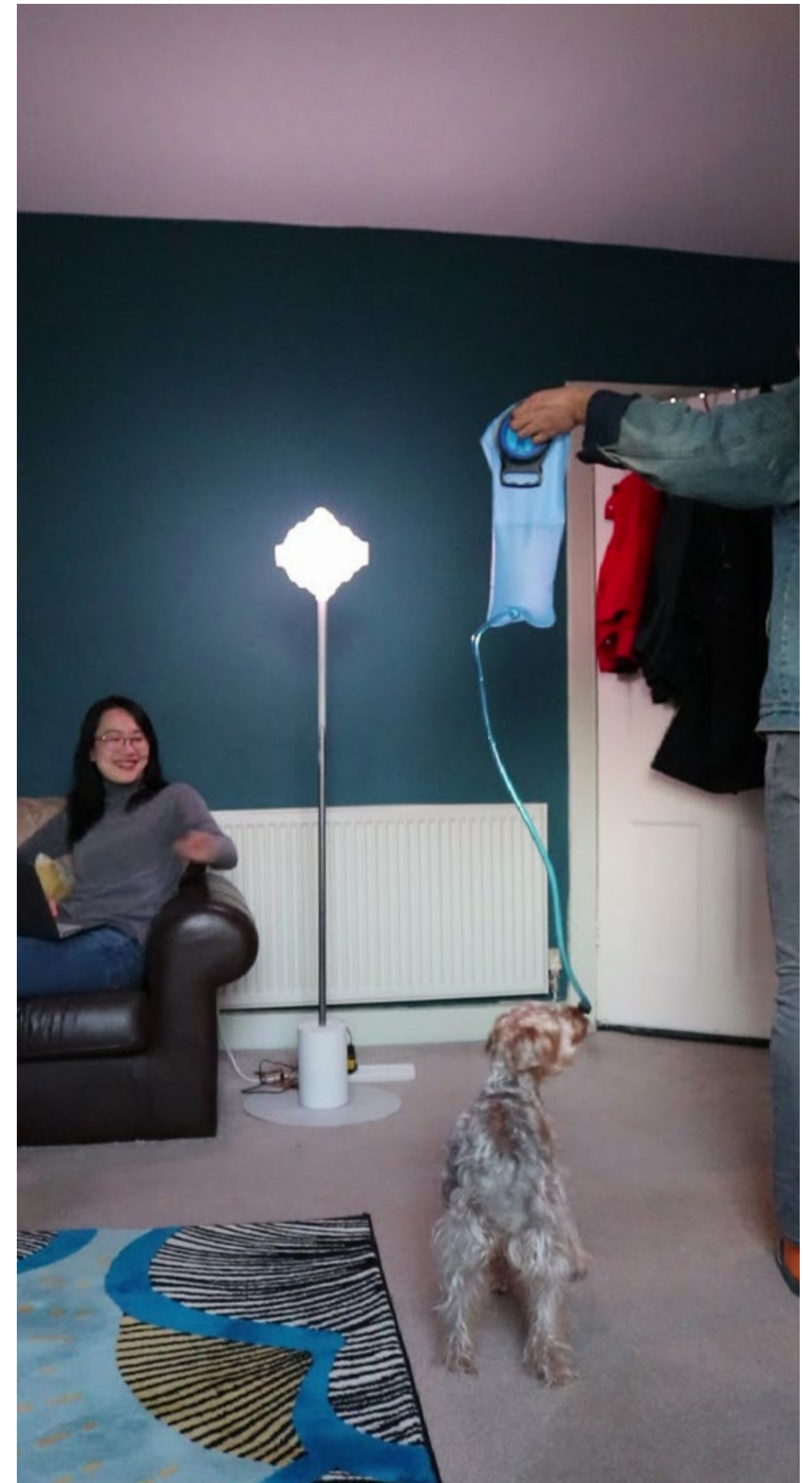


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~2 reveals the tension and changes of our relationships.

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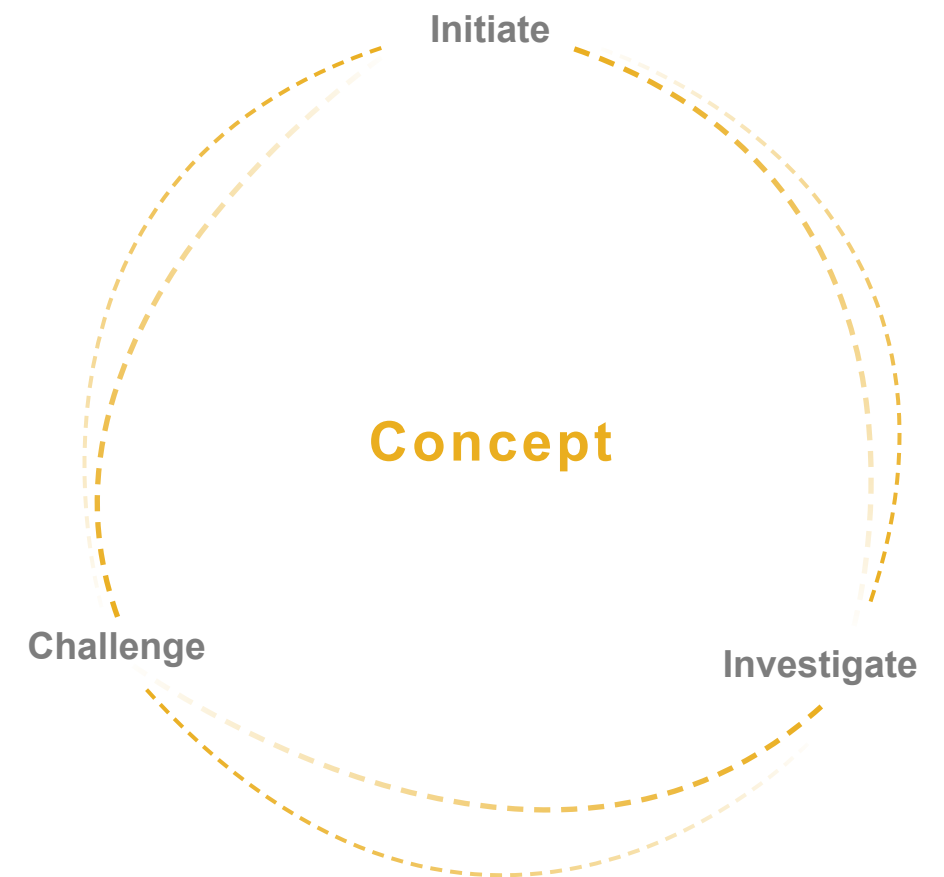
~2 home photo collection, 2019



7

As the light fades on and off,
the waves meet and fuse together quietly.





(Smart) objects have become more intelligent and capable, and our lifestyles have changed rapidly in response to this technological advancement. In consideration of the urgency of addressing the issues surrounding our new object-human relationship (and corresponding to my aspiration to challenge the role of design within industry and academia), the project was inserted into a critical and theoretical environment at very early stage. I used a ‘double diamond’ research approach (developing a series of ideas is on top of one another, considering values by using objects to tell stories, all supported by a literature review of emotional character in existing robots and of the philosophy of being) to identify a new research question and refine a research statement as the central guideline for my practise.

Emotional character in existing robots

Back in 1999, Sony created AIBO robotic dog as its first robot for the consumer market. The first edition of AIBO was able to interact with people and its surroundings, and more technologies were introduced in the updates that followed, such as facial expression, voice recognition and so on. Following the success of AIBO, emotional character became an essential element in home-robot market. Paro (2003) is an interactive robot (seal) designed by AIST, a leading Japanese industrial-automation pioneer. Paro moved from entertainment purposes to therapeutic applications, such as providing comfort for Dementia patients. Although it has been heavily criticised in terms of its ethical implications, Paro interaction is able to promote patient-relaxation and -motivation. By incorporating A.I. technology



9
Le moment, 2016
Yifu Liu

9
Fokus, 2017
Yifu Liu

10
Aibo, 2018
Sony



10



11
AIST, Paro, 2003

12
Elli.Q, 2016

13
The technical dream series, 2008
Dunne and Raby



13

and Internet of Things (IoT) technology, home-assistant robots have also been developed to help people in more-everyday scenarios. Elli.Q (2016) is home-robot developed by Fuseproject (a multi-disiplinary design consultancy). By focusing on aging adults (who might be unfamiliar with technology), Elli.Q plays a companionship role and aims to provide older people with an intuitive interface for interacting on social media and other applications. Similarly, JIBO is a home assistant that helps people in controlling home-IoT systems and managing their personal schedules. Fundamentally both Elli.Q and JIBO act like a friendly-servants interfacing between people and complex systems; thus, emotional interaction plays a key role in making engagement with them more fluent and enjoyable for the user. Outside the realm of marketable products, Anthony Dunne and Fiona Raby (Design professors in The New School, New York) created a robot that aimed explore the possibilities of robot-interaction. In their project, Technological Dream Series: No.1, Robots” (2007), emotional robots are designed to be independent, nervous, sensitive or needy. Unlike the commercial robots described above, Dunne & Raby’s (2007) robot required mindful, deep eye-contact in order to provide the information the user needed. The designers combined a ‘selfish’ (unsecure) character with iris-scanning technology, transforming the relationship between object and human into on of exchange, rather than master and servant. From entertaining robot-dog to speculative robot-conception, these projects have all benefited from the addition of ‘emotional character’ within the robot-objects.

Initiate

Rather than creating entertaining relationships, I too wanted to embody emotional character to provoke thought. In the first-week design-workshop, I was inspired by Afterlife (2009) (a project by Auger-Lozieu studio, that speculated on the idea of bio-batteries created from deceased family-members to create a kind of afterlife for the atheist). Here, the designers creating a 'live-dead' connection, which, at a metaphysical level, made the viewer/ user reevaluate the meaning of being alive. In response, my idea was to create a clock (Fig.15) (an object that relates to time, and the topic of death) that connected to families through its movement. The clock represented family members that had passed away and the idea of providing emotional care those who are grieving. This idea piqued my interest in reminding people of the importance of interpersonal connections through the 'emotional values' of objects. Apart from Smartphones, long-distance connection through tangible technology is the most common examples of this on the market. The Good Night Lamp (Fig.14) is a series of products that aim to connect family-members who are in different places. Each family member has a lamp and they can be switch on remotely, "to tell a loved one 'now's a good time for a chat', 'I'm thinking of you' or 'call me when you get home'". There are other products that transfer similar data into clocks, cups or watches; however, the service and value they provide are very similar. To differentiate my project from these existing examples, I took a different perspective: connecting the topic with globalisation. There are those that fear what comes with a globalised market (the loss of local culture and individuality etc.); however, people in different countries that share the same interests are able to connect through globally-marketed products.

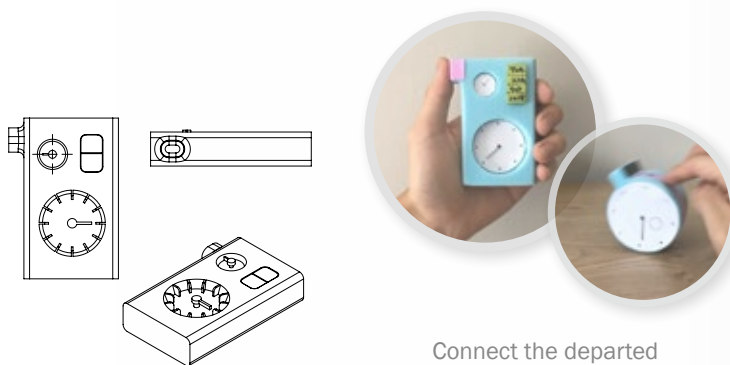


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14
Good night lamps, 2015

15 (right)
Early prototypes, 2018

'Lightpal' (Fig.15) aimed to celebrate this connection through an inflatable light that translating live emotion into a tangible material across linguistic barriers and geographical distance. The idea of the connection being 'invisible' triggered further research into the topic of intangible (wordless or quiet) communication. Films, artworks and contextual texts were identified that contained similar concepts. In Shadow (2018), (Fig.16) a fictional drama directed by Zhang YiMou (one of the most well-known Chinese film-



Connect the departed

Ghost communication

At the early stage, I was inspired by the dead battery project and aims to explore the idea of ghosting communication by using technology. Extending someone's existence through their active online identity.



Lightpal, 2018

Sketch/ Cardboard model
A expressive light connects a long-distance "penpal" in a different country. Users communicates through the active form.

Quiet communication

Could there be new ways of communication, other than talking, texting?

Connect People



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directors), the avatars can communicate through listening to the change of rhythms in music and analysing the movement of Gongfu. The desire to communicate without words is deeply rooted in Ancient Chinese philosophy and fairytales. Marina Abramović (Yugoslav, b. 1946), created one of the most famous Art performances at MOMA, The artist is present (2010) (Figure.17), “passively inviting visitors to take the seat across from her for as long as they choose within the timeframe of the Museum’s hours of operation. Although she will not respond, participation by Museum visitors completes the piece and allows them to have a personal experience with the artist and the artwork”. (MoMa, 2010) The work invites visitors to engage and being present with the artist. In feedback, a lot of people said they experienced a powerful emotional connection without saying anything (ibid.). In the artwork, Strangers (2008), (Fig.18) the Latin-American artist Amalia Pica discovered a new type of quiet communication. The artwork invites two volunteers to hold a string with flags for 20 minutes, with the goal of keeping the flags off the ground. Two complete strangers create a connection; however, due to the length of the string, they cannot see or hear each other properly, so the only way to communicate is the change of tension and the movement of the



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Shadow, 2018
ZhangYiMou

17

Artist is present, 2010
Marina Abramović

18

Stranger, 2008
Amalia Pica



18

string. This reminds us that many of the sensual experiences created by human-connection are forgotten or lost in everyday life. By linking the concepts of quiet communication and emotional objects, I was led to think more about the potential role (Smart) objects play in relation to human relationships, and how physical interactions provide a different way of connecting people.

Philosophy of being

The final research statement for this project was formed through a brief literature review of Being in Time by Martin Heidegger. The French philosopher René Descartes, stated that humans can only be certain about one thing: self-awareness in thinking (“I think, therefore I am”, Descartes, 1640); however, the German philosopher Martin Heidegger proposed the concept of, “being in the world”, in opposition to Descartes’ privileging of the separation between body and mind. To do that, Heidegger coined the term, “Dasein” (“existence” in German), where, “Da” stands for there, and, “sein” means being. Cartesian subjects can think without body or surroundings, but Heidegger’s subjects addressed the relevance of ‘there’, in the world. (Bolt, 2012) In his mind, the world could not be separated from our existence, as we are curated by, and respond to, the world all the time. For instance, from the moment I step on the street, I have to actively react to the movement of other people on the street in order to avoid colliding into them. My surroundings (people and objects) at that moment frame my pathway, thus, I am thrown into the world, and even though I might have walked on this street a thousand times, each experience is different. Heidegger named this relationship, “thrownness”. Heidegger

addressed this notion of praxical knowledge within the world in his Tool Analysis, in which a hammer cannot be truly understood without hammering things with the hammer. For Heidegger, these subtle sensations gained from practises cannot be understood through words and theories: “Understanding is not a cognitive faculty imposed on existence, nor does it have the character of contemplative knowledge of the world. Rather, understanding is a concrete experience of being-in-the-world” (Heidegger, 1962: 20). Heidegger thought the action (praxical experience) we take in responding to thrownness plays a key role in understanding ourselves. As shown in the street scenario, being-with-others (people on the street) is part of the thrownness. Here, “Dasein has fallen away from itself as an authentic potentiality for Being itself, and has fallen into the world. Fallenness into the world means an absorption in Being-with-one-another, in so far as the latter is guided by idle talk, curiosity, and ambiguity” (Heidegger, 1962: 20). Commonsense is a concept that stands for the process of creation of the general shared understandings. As part of thrownness, commonsense understandings cannot be created by any individual alone, as the actual exercise of being with others allows us to create these critical common-sense understandings to our world. Paul Dourish connects the theories of ontology and ethnomethodology in his research into the foundation of embodied interaction (2004), summarising that, “commonsense understandings are the object of ethnomethodology’s investigation”. (Dourish, 2004:75) Indeed, the practise of ethnomethodology is mainly conducted through analysing real conversations and the

words used in them. For example, , “hello” can be used in different scenarios and stands for different meanings and emotions. As a result, the theoretical understanding of the word tends to habituate the way people perceive and understand others. Even the common-sense understanding of, “hello” requires constant revaluations by individual based on the actual practise.(Dourish, 2004) Through the lens of linguistic analysis, the study of ethnomethodology proves the necessity of a constant revaluation of our relationships with others, in order to avoid the habituation with others.

Conclusion

By connecting the subject to design and technology, new technology and services (from social media to Smart products) have curated a subjective sensation and changed our ways of being with others. Today, both tangible and intangible information shout loudly from all angles and take our attention away from our embodied thrownness in the world. For example, the quiet-control technology (Figure.19) developed by Bose (a leading sound-device supply-company) aims to mute noise from users’ physical surroundings through their headphones. In exchange for concentration and productivity, the product isolates people from the space they inhabit. Thus, the other people around the user become irrelevant and human-human connection is cut off. Similarly, Panasonic developed blinkers (Figure.20) to focus the senses of sound and sight for officers. By shielding individual eyesight, the connection between people is, once again, cut off. In the home environment, Ford invented a Smart bed



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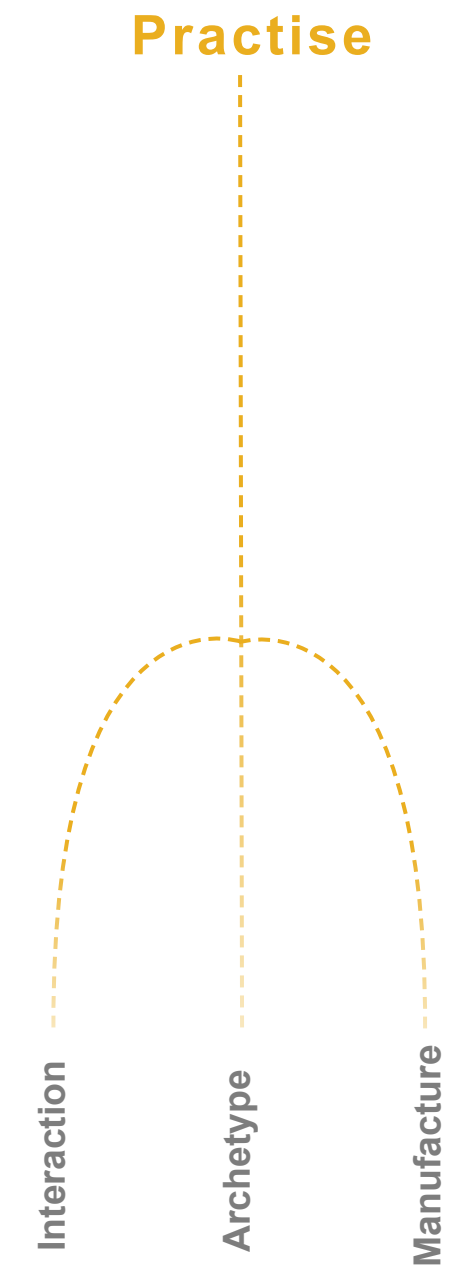
19
Bose quiet control earphone, 2016

20
Blinkers, 2018
Panasonic

21
Youtube Logo, 2005

that would keep, “selfish sleepers” on their side of the bed. These designs show a tendency for designing for isolation. Apart from these tangible products, tailored digital-information is seducing us into seeing other people within our physical surroundings as less relevant. For example, through (personal preference) data collected outside and inside their systems, the recommendation lists on YouTube and Netflix are constantly changing and trying to match with each individual (to keep people watching). As a result, it becomes harder for people to refuse the customised offers and return to everyday life and the people that surround them. By curating the subjective sensations of people, technologies allow people to curate their online relationships; however, within this curation, these technologies have habituated us into a certain (online) way of being, in which the experience of being with others (being in the world) is lost or ignored.

In this project, I wanted to challenge this usage of technology, which separates us from being with others. Rather than limiting our ways of being, this project explored using technology to enhance our relationships with others and help us toward a more complete experience of being in the world.



The whole design practise is deconstructed into 3 sections, including interaction, archetype and manufacturing. The interaction design follows the ideology of embodied interaction, this section draws a clear design evolution towards a narrative-driven concept. The section, archetype, connects the narrative, form and material. The last section manufacturing presents a tied relationship between form and process design.

Interaction

This part of research wishes to explore the concept of unreadiness-to-hand and use it in the design practise. Followed by designing interactive interventions with this rule. Then find the right object and narrative to form the final design proposal.

when a lamp does not function properly, people then start noticing its relevance. Heidegger named this ‘out of order’ status of tools as unreadiness-to-hand. This theory is backed up with the tool analysis from Heidegger’s book Being in time (1937). In the book, there are 3 situations where unreadiness-to-hand could happen. Firstly, a tool is broken in use. Secondly, a tool is unavailable when is needed. Thirdly, a tool is thrown in between our focus and purpose, like a barrier (Bolt, 2012: 101). Seen as thought experiments, a lot of works from designers and artists consciously and unconsciously used Heideggerian tool theory to create mindful interactions. The technical dream series robots (2008) by Dunne and Raby, rather than serving, these robots form an open or equal relationship with people, these robots are exchanging their services for some pet-

like interaction with their users. By distracting people away from the functional purposes of these robots, their approach links to the concept of “barrier” from unreadiness-to-hand. In Strangers (2008) (Fig.22) by Amalia Pica, the demanding relationship between object and human are reversed as well, people become the ‘living machine’ to serve a string with flags. The artwork shares the unavailable quality from unreadiness-to-hand, two participants become part of the interaction. Thus, the interaction is only completed when participants are available. The avant-garde industrial designer Konstantin Grcic believes in the power of everyday objects. Konstantin is interested in designing discomfort furniture to question the experience of being in the world. For instance, the 360 degrees office chair (Figure.23), one of his collaboration with MAGIS (the Italian furniture design manufacturer), looks uncomfortable due to the minimal contact-area for sitting. However, it was designed to encourage people to actively move around workspaces and discover how to use the chair according to individual bodily senses and intuition. As a result, the chair design seeks a new relationship with users rather than ‘serving’ (Antonelli, 2014). To summarise, by adding a new layer of either barrier or discomfort, interaction with objects could increase people’s awareness about their experience.



22

22
Stranger, 2008
Amalia Pica

23
360 chair, 2009
Magis

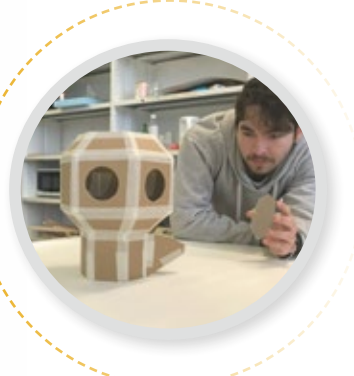


23

Unreadiness-to-hand

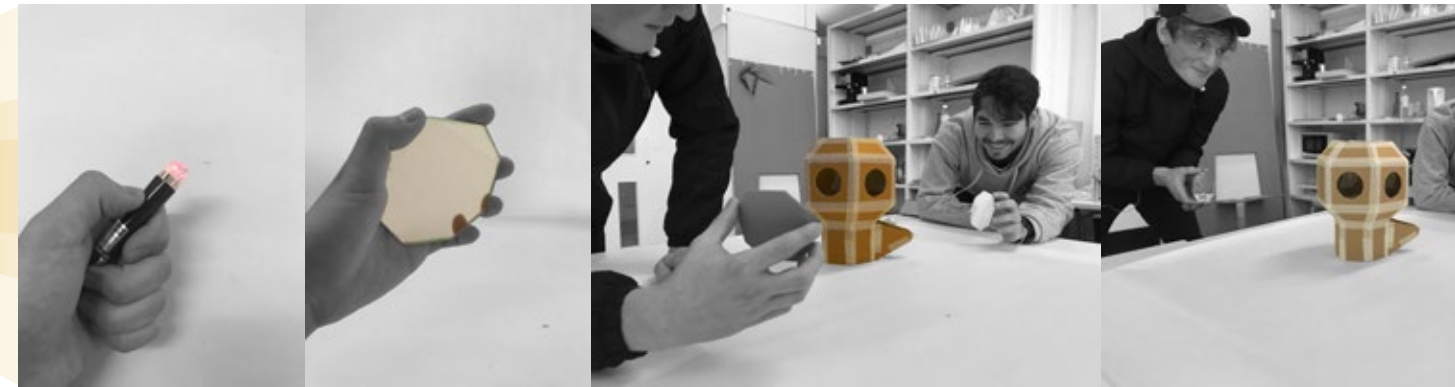
Interventions

To connect the theory and practise, a series of the disruptive intervention was designed that aims to connect people. These rapid prototypes are made of cardboard with simple Arduino sensory systems, they serve the purpose of visualising and testing the speculative interactions.



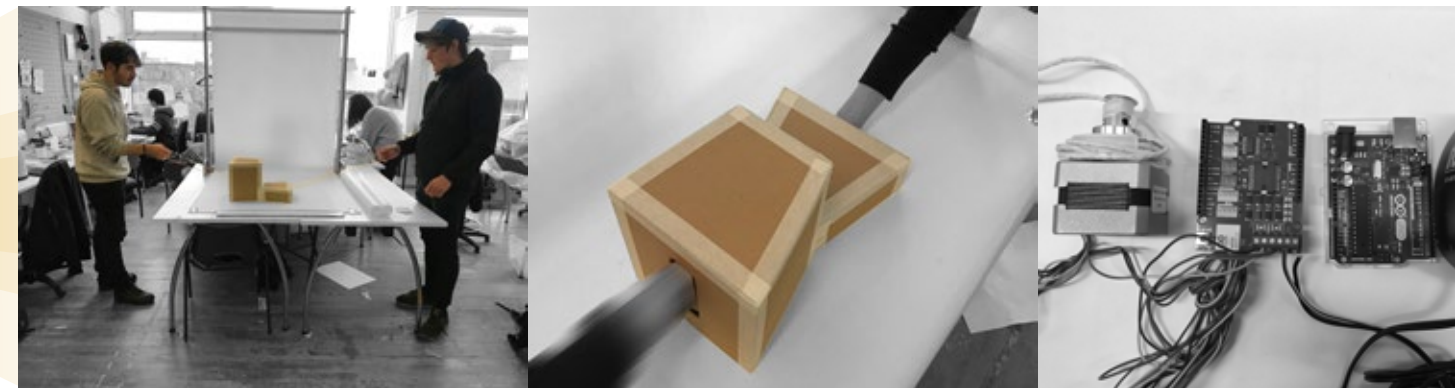
Laser, 2018

Cardboard model
Users collaborates on bouncing laser into the demanded position.



Distance, 2018

Cardboard model
Users pull the cable away to activate the machine, then the cable retracts to pull the users closer, hands touched at the end.



Sound, 2018

Cardboard model
Forcing users to make a harmonised sound to activate the kettle.

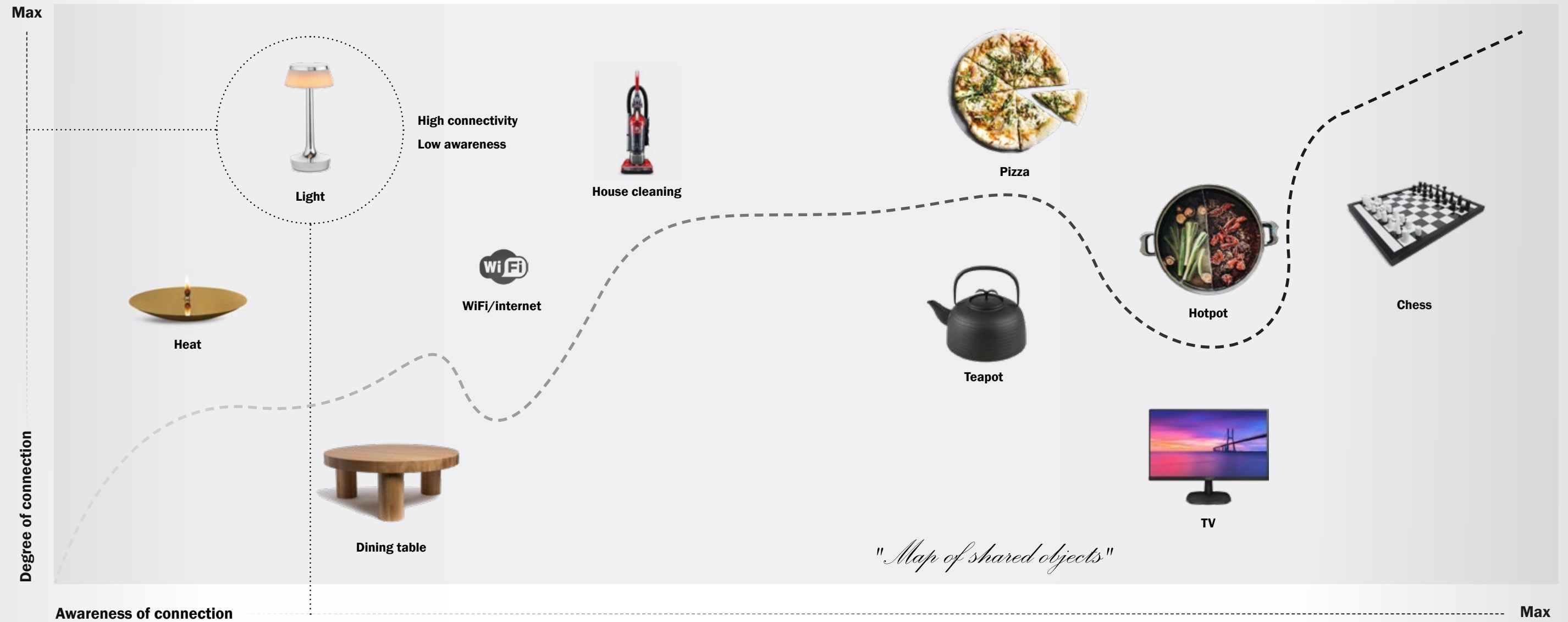


Then, I was lost in front of feedbacks

According to feedbacks from 15 different individuals (friends and tutors), laser kettle was widely appreciated due to its playfulness. However, these prototypes are found difficult to relate to users in everyday scenarios. “In effect, design speculation requires a bridge between the audience’s perception of their world and the fictional element of the concept.” (Auger, 2012:12) Summarized by speculative designer James Auger in his paper, familiarity makes a difference in design speculation. Reflecting on the feedbacks, I want to create a product for everyday scenarios, thus, this design project needs to be started and supported by a solid narrative with a sense-making relationship and familiar environment. For example, ‘young couples at the home’ would quickly help the audience understand the design intention (possibly connect couples in home). Seen as a tool, narrative (storytelling) has been widely used in all creative professions. In this project, I decided to use relationship-centred narratives to drive and visualise my concept. In order to form a speculation bridge, objects in narratives need to be selected carefully as well. Thus, interaction (object) relabelling was introduced as a practical research method that asks volunteers to analyse the sharing quality of objects. Then Narratives are created based on the selected objects from the relabelling process. The interaction design naturally follows the result of relabelled objects and narratives. By doing that the tangible outcome would be easily related to the audience (users).

Objects are normally considered in terms relating to functionality, however, the object relabelling exercise pushes participants to observe their surrounding in a new way. In this case, 5 chosen volunteers were asked to explore the “sharing”

quality of things (that connect people in a shared space). To do that they were asked to write down a list of shared objects in their houses. There are 2 insightful variables learned from the feedback——degree (quality) of connection and awareness of the connection. As a result, “Map of shared objects” is formed in a graph that rated different objects in their ability to connect people. The vertical axis refers to the power of connection, and the horizontal axis refers to the awareness of connection from users. To conduct further research, the results can be sorted into direct connections and invisible connections. For example, teapots represent direct connection, because tea-drinkers are bounded together through its conventions. Similarly, pizza, hotpot and Tv share the same quality. Others, including light, WIFI and heating, are sources invisibly (unaware to users) connect people together. For example, people are naturally(unconsciously) stay closer to a light source in a dark environment. These invisible mediators are better for further exploration because they do not ask for new traditions or rules to be set. Thus, the object could emerge into everyday life gently.



Narratives

Couples

In the morning time, everybody is in rush. Thus, couples barely have time for each other.

By linking the sharing quality of bathroom and unchangeable time for brushing teeth, this design aims to create a slow eye-contact moment for couples in the rush morning.

Grandparents and grandchildren

The age difference could create barriers for teens and elders.

A series of analogue house cleaning tools for collaboration purposes between elders and youngsters.

Couples

In the bedtime, phones and computers are always around, couples barely have time for each other even in the bed.

A night lamp for couples, controlled by the blowing actions from two.

Parents and kids

Parents need(wish) to spend time with children together, however, work and social relationship take away their attention from their children.

Puzzle game for the family to get access to the internet.

By connecting the found invisible connectors to existing relationships, I created 4 narratives-driven design that uses design to celebrate (fix, discover) relationships including parents with children, lovers, and elders with grandchildren.

Among all the narrative-driven design, the night lamp (couples) is selected. The concept addressed the conflict between individual-centred technology and the relevance of being with others. Ironically, inside one of the most intimate spaces in the home, this couple (lying next to each other) were ‘separated’ by screens, shown from a photo (Fig.26) captured by Hanif Shoaee (displayed in V&A museum). Shoaee said, “Disengaged and facing away from one another, the couple here are absorbed by their screens, a situation increasingly familiar to many of us.” (Shoaee, 2018:19) The situation becomes even scarier since it has grafted into our life. Thus, I want to employ the interaction to bring people’s attention back to their partner.

By applying the critical design approach and unreadiness-to-hand (Heidegger) quality, I wanted to create a meaningful interaction that reflects the design intention of connecting couples. By exploring different possible interactions, including touching, singing (together) and bouncing lasers, blowing is found to be suitable for bedroom scenario due to its poetic relationship with kissing. As a result, in order to switch ON&OFF the lamp, couple (before going to sleep) have to softly blow into the lamp together. In addition, the intimacy and playfulness speak about its potential user group (couples). From the perspective of affordance, the familiarity of blowing a candle (Fig.27) led the users to be able to understand the function intuitively. Apart from that, the action of inhales and slow breath potentially help people to adjust



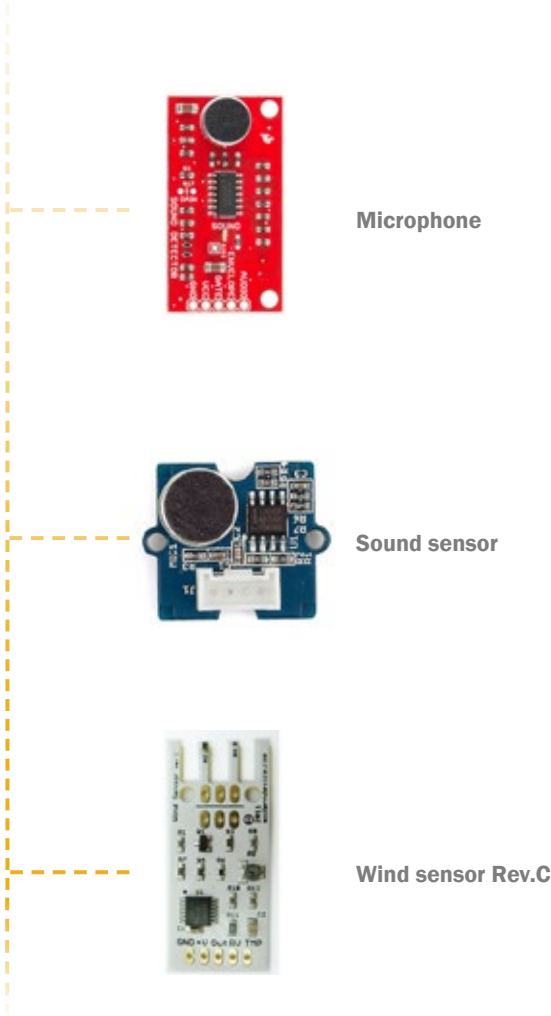
26
Technology in Bed, 2014
Hanif Shoaee



27
Candle, 1963
Takashima Yajuro

(their heart rates) to sleep mode as well.

With the general outline of the function and intention of the lamp, the process of finding and filtering electronics parts becomes straight forward. Sound sensor and microphone were used in the early prototypes for user-testing purposes, however, both sensors are unstable because of their sensitive sound detection. As a result, wind sensors are used in the later models due to its refined accuracy and stability. The wind sensor Rev.C (made by moderndevices) is a hot wire anemometer that collects temperature difference and calculates wind-related data by its set functions. The design used the function: $WS_MPH = (((Volts - ZeroWind_V) / (3.038517 * (Temp_C ^ 0.115157))) / 0.087288) ^ 3.009364$, which tells the wind (breeze) speed. By using the wind sensors, the final prototypes are able to be evoked by an intuitive slow blowing action, which fits the narrative scenario perfectly.



$$WS_MPH = (((Volts - ZeroWind_V) / (3.038517 * (Temp_C ^ 0.115157))) / 0.087288) ^ 3.009364$$

Archetype

Without any pre-historical references in a bed lamp for couples, the design benefits(suffers) from the freedom given by the special lighting purposes at the beginning. As a joint activity initiator, ~2 should seek for attention all the time, thus, the material plays a crucial part for ~2. As a result, material research (exploration) has led the studio research. In general, the design once lost its focus in balancing the market and critical, which pushed the design later to represent both intentions in one format.

At the beginning, driven by the bedroom narrative, the lighting was naturally positioned as a wall mounted lamp fixed on the top of the bed. The design is aimed to put the lamp in between couples (draw couples closer) and easy to access (blow). Through brief secondary research in existing markets, there were no archetypes found for this special lighting purposes. Because most existing models are either designed for one person (hotel) or a background mood light. (Fig.28) As a result, in terms of function and archetype, ~2 is entirely new to the market. With freedom in every direction, I decided to frame the material at first. For the purpose of drawing people’s attention back to their dearest, the materiality of the final objects is set to be attractive and engaging (even turned off).

Seen as a living material, glass is not only known for its ability to diffuse (light), but also fits the sculptural quality ~2 pursuits. Under professional supports in ECA, including technicians, cold-workshop and hot blowing workshop, glass was chosen and set as the centre of the practise-led research. In relation to light, the diffusion (of glass) is explored through both primary and secondary research. As a material with diverse



28
Existing bed lighting design
online source

28



29
Glo-ball, 1985
Jasper Morrison

29

30
Alcove in production, 2018
Wonderglass



30

finishes, the nature of illumination with glass has been celebrated by all world class designers and lighting manufacturers. The secondary material research is focused on analysing some existing solutions for glass diffusion. With a uniform whiteness, Opal white and sandblasted finish are found to be used frequently for light diffusion. The British Industrial designer Jasper Morrison favoured these finishes and used them in his representative work Glo-ball (1985) (Fig.29) with Flos. The light diffusion plays a key role in creating this demanded lightness and emptiness. known hot glass generates a wavy texture when layered over the metal surface, Ronan Bouroullec and Erwan Bouroullec transferred the special texture to a series of vases that diffuse sunlight. In their collaboration with Wonderglass, (Fig.30/31) people are encouraged to play with different coloured bricks and appreciate the wavy texture from the process. Colore, a lighting sculpture by the Italian duo Formfantasma, who used the coloured glass and LEDs to form a magical colour diffusion on the wall. Other than diffusion, light could benefit from the internal reflection by the glass as well, both Noctambule (from Konstantin Grcic) (Fig.33) and Taccia (from Castiglioni brothers) (Fig.32) celebrated this quality in the glass. The transparent finish enhances the sculptural quality of these pieces and created a floating lightness to the design.



31

31
Alcove, 2018
Wonderglass

32
Taccia, 1962
Flos

33
Noctambule, 2019
Flos



32



33

Glass reveals various characters with the different manufacturing process and implications, so the primary research is focused on experiencing different glass manufacturing processes in ECA glass workshops, including digital casting, sandcasting, mould-blowing, and free-hand blowing. The digital casting glass is normally moulded (plaster mould) with complex shapes (3d prints) and then burns out the 3d prints in a kiln over 850 degrees, manually layer some smashed glass in the empty mould and use the kiln to melt and fill the mould with glass. The digital casting pieces heavily rely on the details of mould making, so it can be used to create extremely complex shapes, however the limitations are its weight (outcomes are solid (heavy) glass), scale (normally quite small) and unclear surface finish (difficult to clean with complex shapes). (Fig.36) Sandcasting shares the same limitations (with digital casting) and the results are covered by sands. (Fig.35) The process involves plugging a positive mould into the sand and pour the hot glass into the negative space created. Other than casting, as a traditional glassmaking technique and has been used widely in lighting systems, mould-blown glass has two types of finishes-----still blown pieces and turn blown pieces. A still mould piece captures more details from the mould including seam marks. On the other side, a turn mould piece comes with excellent surface finish however it could be limited by the complexity of shapes. For both processes, the material choice for the mould could change the texture of glass dramatically. The moulding materials could be made from graphite (Industry level for wine bottles), ceramic, cork, cherry wood (Fig.x), metal (Fig.x) and plaster. Graphite is widely recognised as the best material for both moulding methods due to the material's softness, reusability and level of details provided. Similar to Graphite, CNC-milled solid metal and solid wood

provide good details and reusability. However, they are not ideal for studio practise and one-off piece due to the high investment required. Even though plaster moulds are barely reusable and very fragile, but they appear to be the best option for general practise with its accuracy provided and low investment required. After tasting a flavour of every material and their corresponding finishes, pieces are made and collected from ECA glass department to run diffusing tests with LEDs (Fig.36-39). Other than glass, a series of material is introduced and tested (with/ without glass) at this stage, including rice paper (a traditional eastern lighting diffuser), acrylic (similar quality with glass) and Tyvek (Fireproof paper). Through experimenting combinations of these materials with LEDs (Fig.40), 2 variables are found to be essential for light diffusion--- distance (between led and material surface) and transparency of layered materials.



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Glass sandcasting, 2019

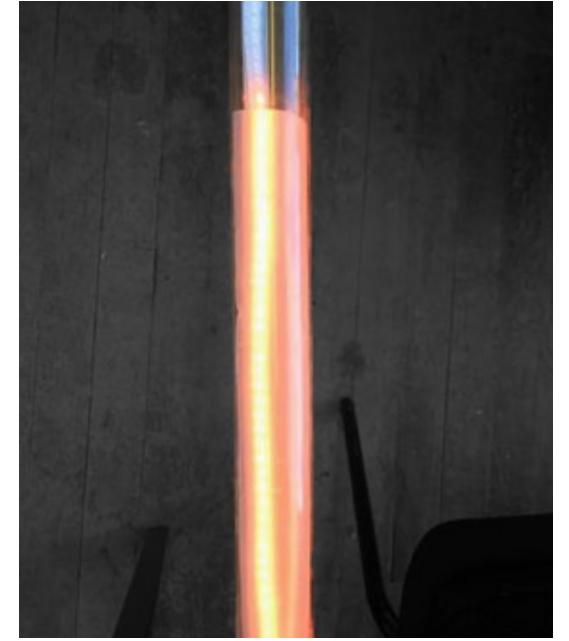
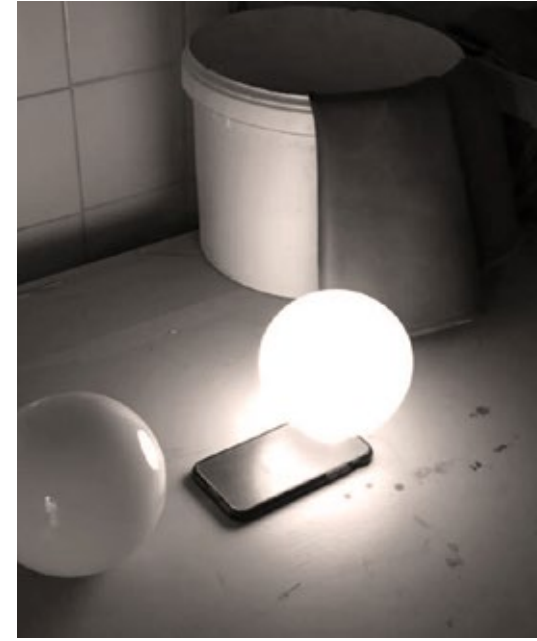
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Lighting test with sandcasting glass, 2019



36
Lighting test with
Digital casting glass

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Lighting test with
Colour glass



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Lighting test with
transparent glass

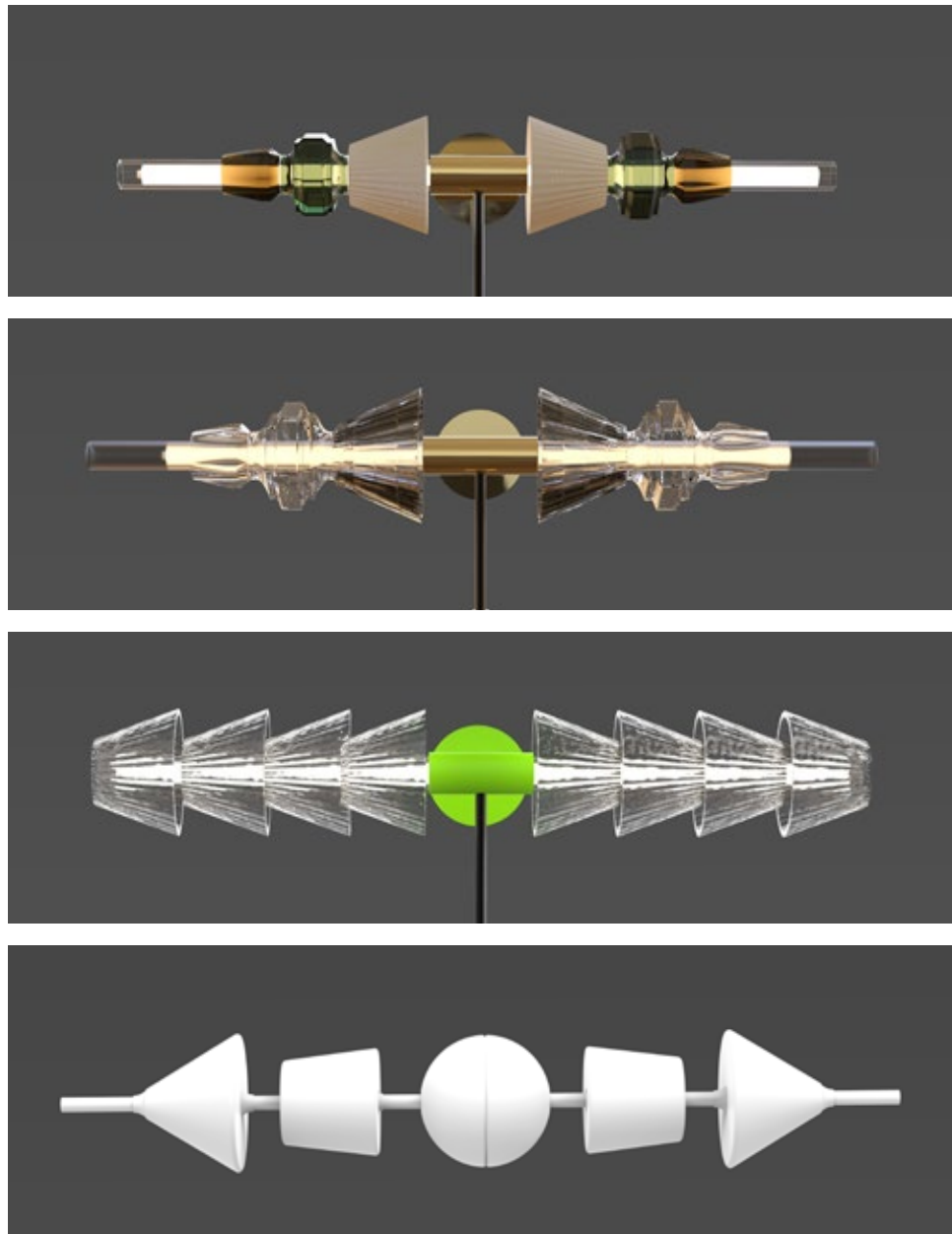
39
Lighting test with
sandblasted glass



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Lighting test with
Colour glass bubble/
Glass tube/Tveyk

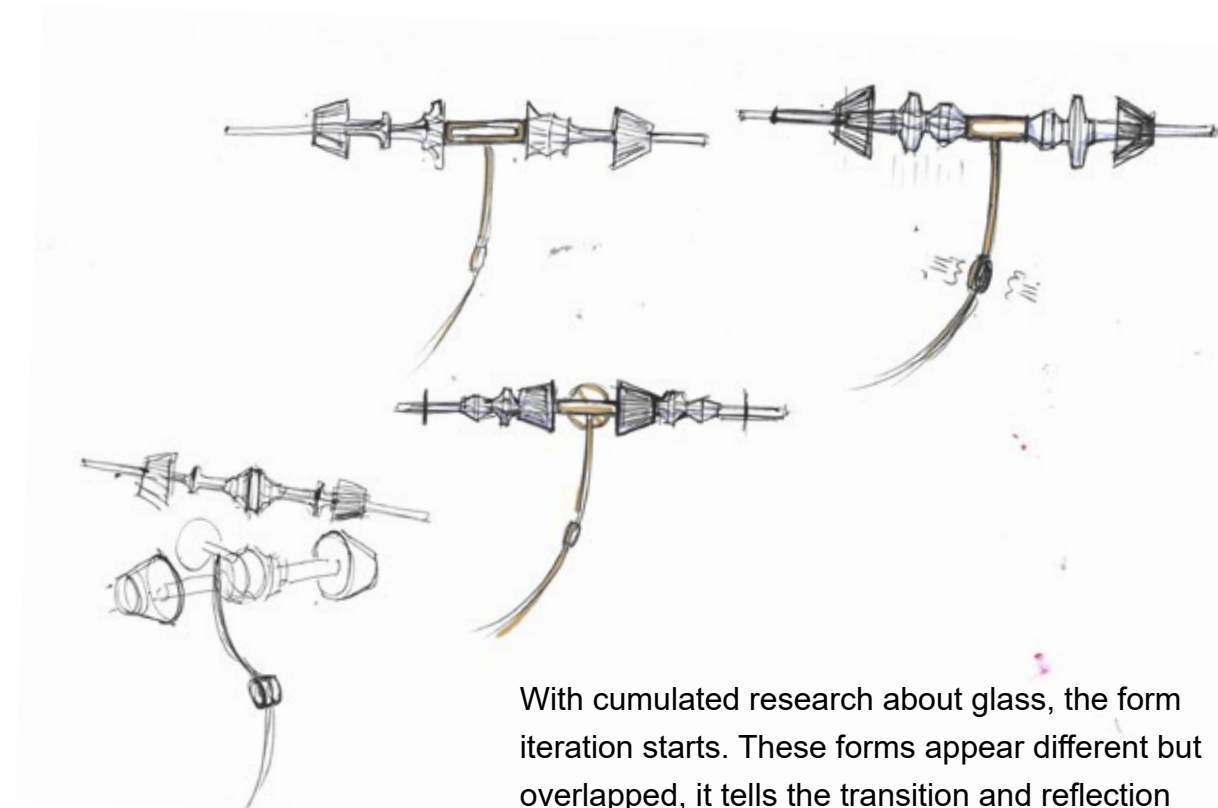
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CAD iteration, 2019
From first proposal to second proposal



With cumulated research about glass, the form iteration starts. These forms appear different but overlapped, it tells the transition and reflection of my process and shows the diversity of my design approach. Known the fact that glass shares many different finishes, I was interested in incorporating them into one object. The first lamp design (Fig.42) is a combination of different (glass) lampshells. By joining different lamp shades, I wanted to bring back the old-fashioned lampshade with a contemporary design language. The cone shape from lampshades also tells the story of blowing interaction. During quick tests with paper models, the position of this lamp (overhead/wall mounted) is found unideal for blowing interaction, where people need to sit up and reach the lamp before blowing to the lamp.

The first major iteration shifted my focus to the beauty of minimalism and engineered mechanisms. Up against the problem relating to the awkward user experience, I started to look at different hinge design for a better arrangement. String light (Fig.43) by Flos and Michael Anatasdiades, the design successfully used cable and hinges to create freedom in arranging a lighting system for the home. WireLine by



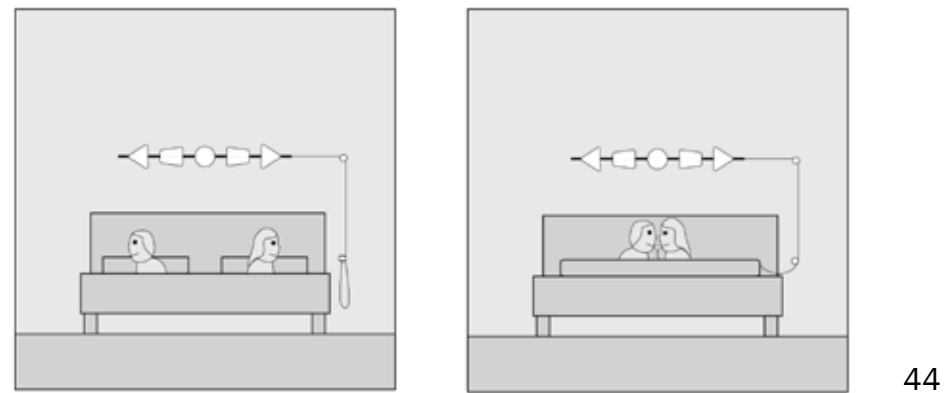
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42
Sketch, 2019

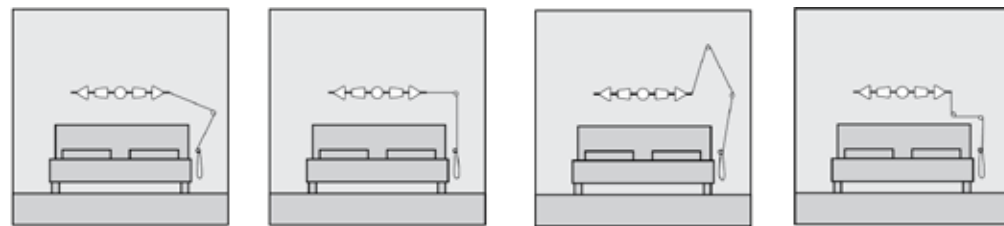


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43
String light, 2019
Flos



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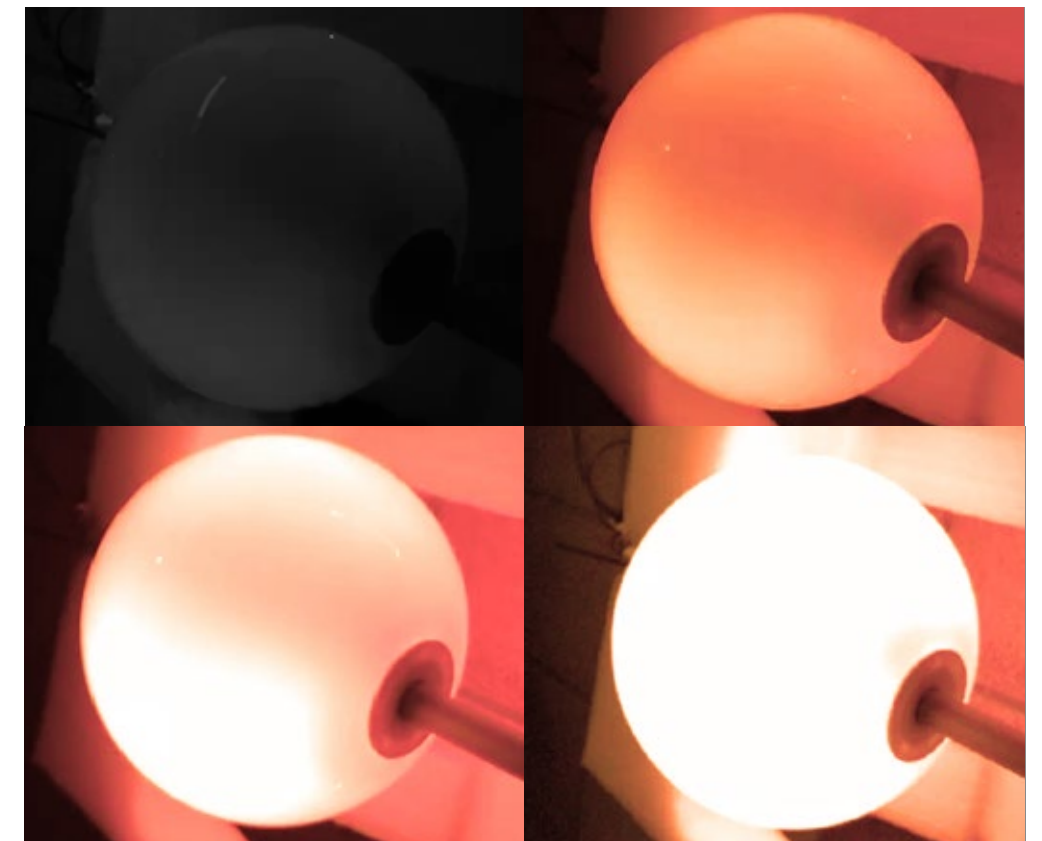
Formafantasma is also a great example to use soft material and mechanism to form flexible user experience. In these examples, users are encouraged to develop their own arrangement to fit the design in the home/office environment. By learning from these examples, the lamp and interaction are linked by hinges and cables around the bed. Through a combination of sketch, CAD, prototyping in glass, this design was delivered at the midterm session. Resulting in a clean and refined lighting system design, the interaction is led by a remote switch attached on the wall. (Fig.44) People could easily take it off and blow into it together. A series of the lampshade (glass) are mould-blown within ECA glass department. 3 different glass colours are selected and tested, including opal white, Enamel White, Enamel White Soft. Enamel white soft (Fig.45/46) was selected for final design because of its warmth matches the bedroom.

44/45

Flexible cable arrangement
design, 2019

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Blowing test with sound
sensor, 2019



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During user tests (Fig.47), participants appreciated the interaction and the design philosophy behind the object. However, the tests were not easy to proceed, because some participants feel awkward to use this lamp with others. People would evaluate their relationship and then decide to blow or not. As a result, the tests proved that this interaction design reveals the tension of the relationship between people. However, by introducing a new switch, the original aspiration in challenging the lost of being in the world is weakened. Because users lost direct contact with the material——light.

The main question of this proposal shifted to 'design the best bed lamp for two', which is



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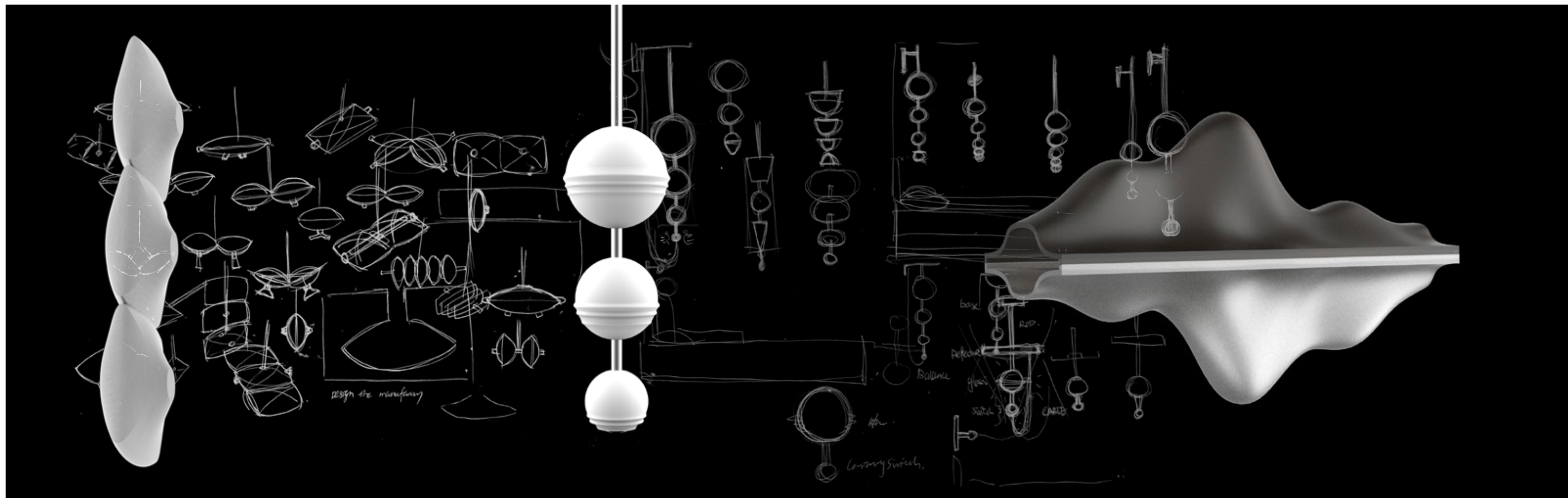
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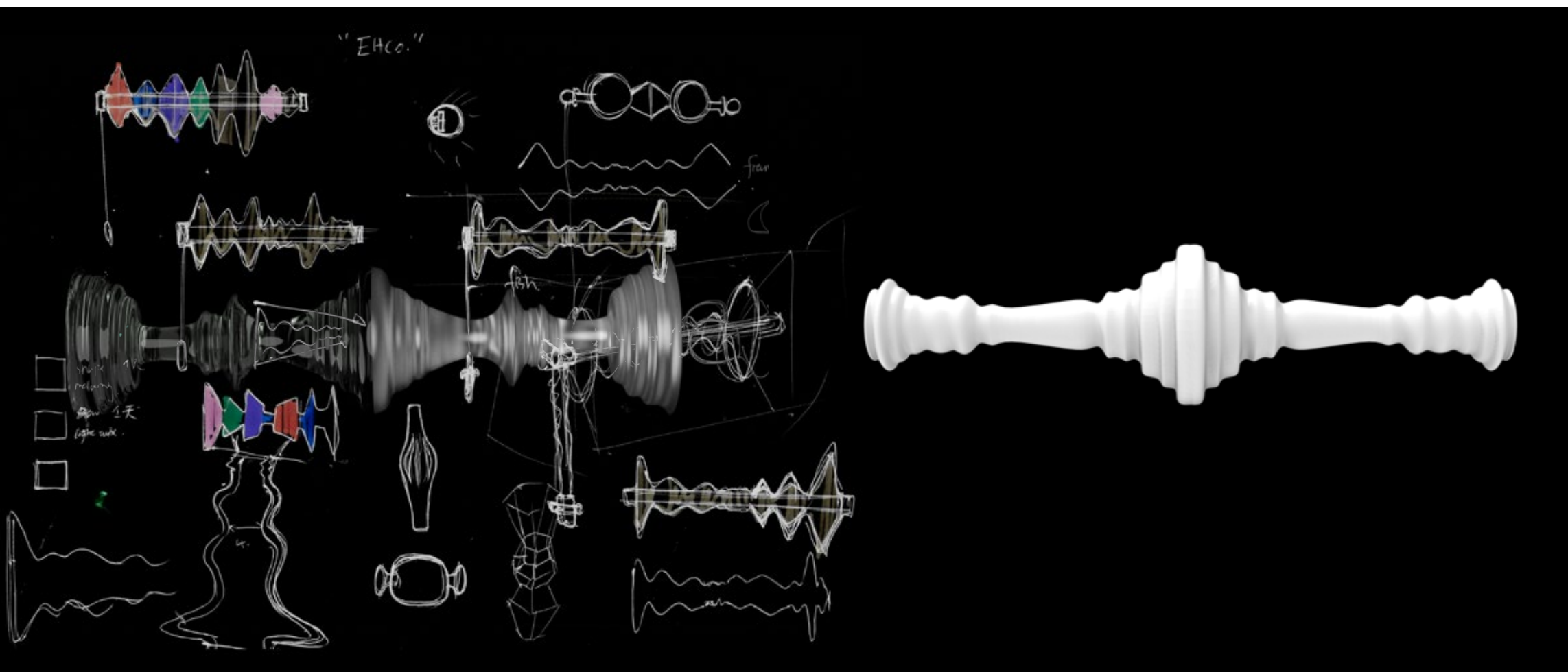
'Switch' Prototype test, 2019

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Prototype detail, 2019

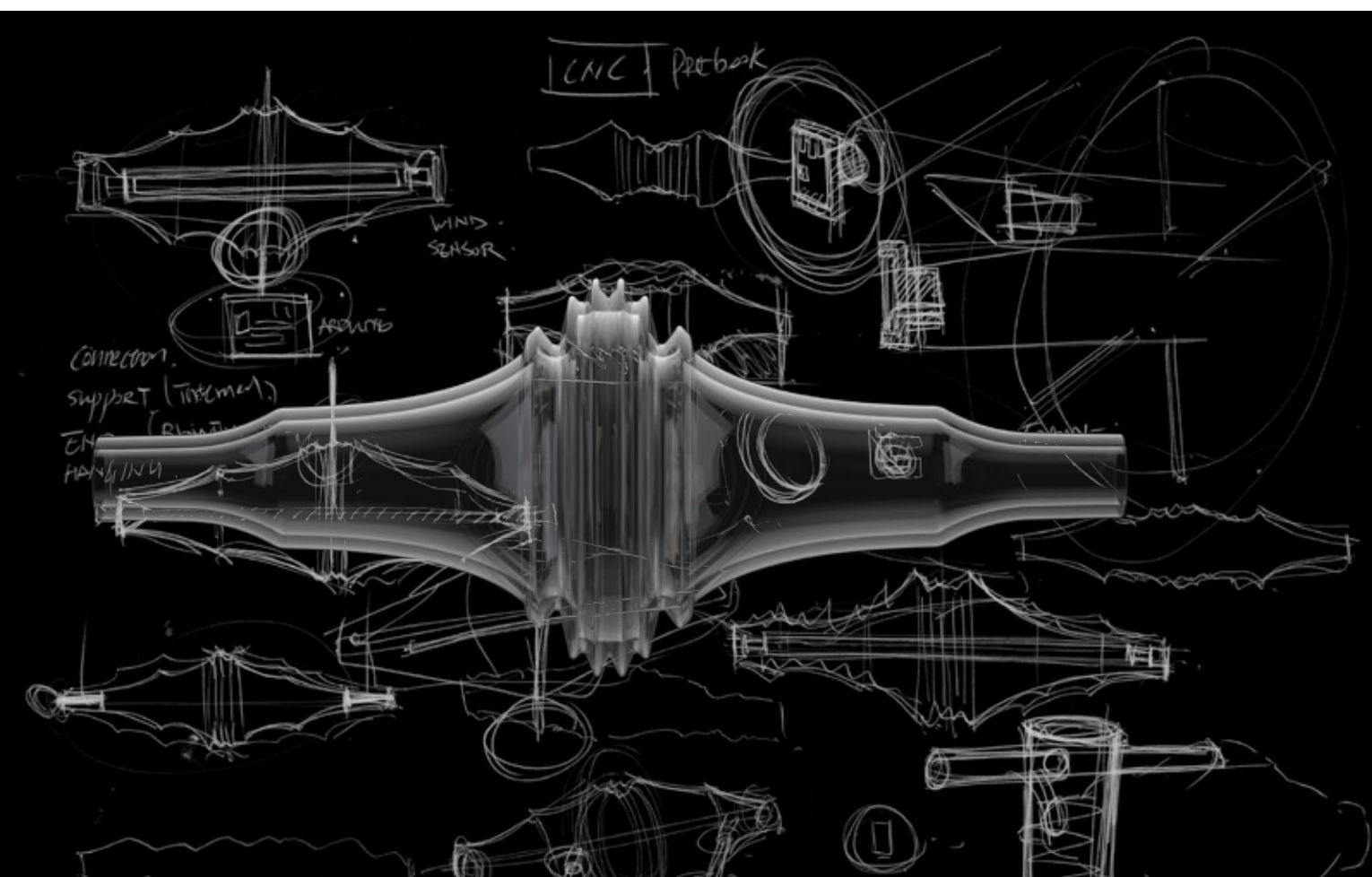
not my primary intention. Through a 2 week long reflection and reassessment, I realised the theme of togetherness weights over a comfortable(practical) using experience, and this struggle comes with the early determination in balancing two different design intentions. Thus, the scenario was reset beyond the original narrative and ~2 became an interactive lighting object, which could become a chandelier, a floor lamp or a tabletop lamp.





The learning from form iteration pushed the design to go beyond the notion of lamp, to become something on its own. At this stage, I focused on how to express the action of blowing and joining together. Seeing this design as a passage between 2 people, the form sets itself to visualise the invisible connection between people. (Fig.50) After many physical and digital explorations, the final form leaves a simple and powerful message, which the abstract form captures the transformation of light due to air-blown by two people. The waves meet and fuse at the centre to celebrate the harmony in togetherness. However, the detail of the waves are defined by physical making.

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CAD iteration map, 2019

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Story sketch, 2019

Manufacture

As a symbol for British design, some great role models celebrate the notion of the original process, such as raw edges design studio, Glithero studio and Max Lamb. In their works, the design of process weighs more than the outcomes, some may argue that their real products are the original stories (methods) behind each item. For example, The big Dipper Chandelier (Fig.51) is a project developed by Glithero studio, quoted from Gareth William, who introduced this work in the book of 21st century, “the complex mechanism allows the layering of wax around the wick to be experienced as a performance and the artefacts that are produced are testament to the process of their own production.” (William, 2012) In this work, the process informs the final shape and Glithero spent the most time in developing the machining process rather than the final outcomes. ~2 employed the same rigorous attention to both process and outcomes. The quality of the glass is closely tied with its manufacturing process, which plays a crucial part in leaving a visual statement. In fact, the making of ~2 became a practise in designing both the manufacturing process and its outcomes.

Drawing naturally started and framed a general guidance for final shapes. However, when CAD (computer-aid-design) was introduced to the process, specific dimensions (required for CAD) destroyed the intuitive freedom gained in drawings by hand. Desired for a sense of familiarity in drawing a curve, the process went back to a traditional crafts tool, (plaster) lathing machine, by using the limitation brought by the rotation along the axis, I framed details

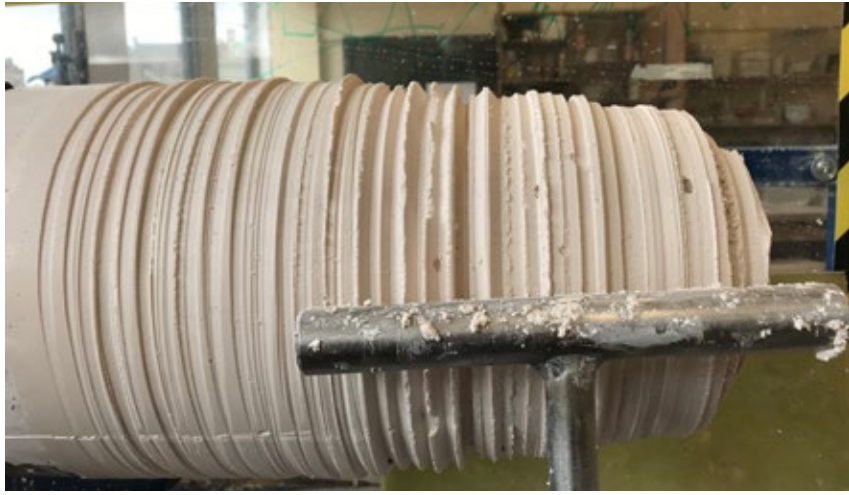
of the shape in the lathing transformation. Tapper, float, cut, curves, waves.....the lathing process gives me full control over the shape in its finest details. Although the lathing process is recognised as time-consuming, it allows me to stop and reflect while it is running (rotating). This experiment (in lathing) ended with 6 variations on scales, patterns and curvatures. Rather than speculating through rendered images, the plaster lathed models are natural results from the process of making and give people direct sensations in their visual volumes and potential characteristics. Through discussions with tutors and technicians, we made a collaborative decision in using mould-blowing method to make these pieces. The redesign of traditional moulding process plays a key role in manufacturing the glass lampshell.



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Big Dipper chandelier, 2007
Glithero studio



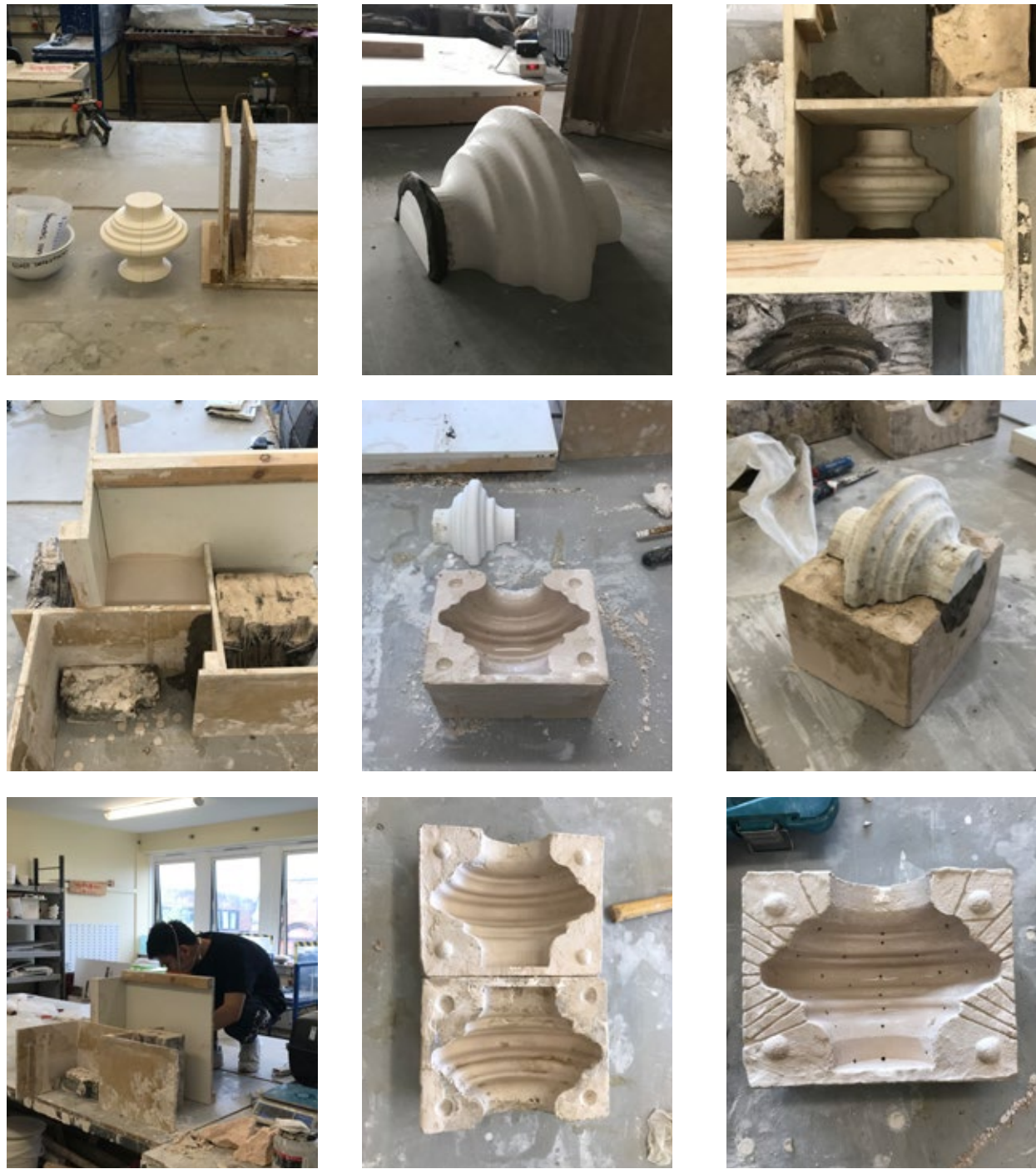
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Plaster lathing models, 2019



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3D printed models for casting, 2019



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Final plaster moulding process, 2019



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Selected plaster moulds iteration, 2019



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Plaster mould detial shot, 2019



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Small scale blown pieces, 2019



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~2 Chandelier scale blown piece, 2019

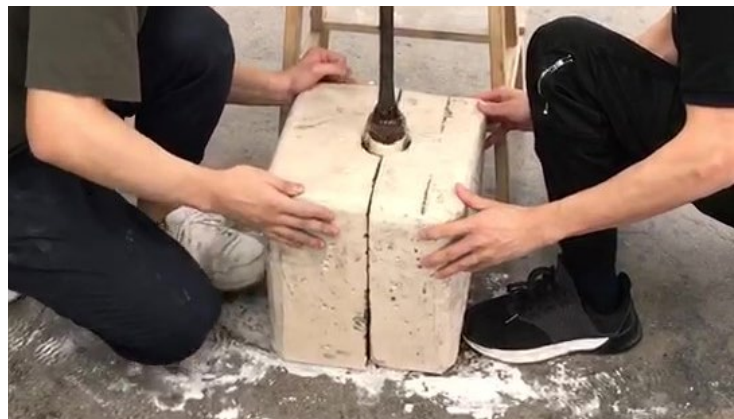
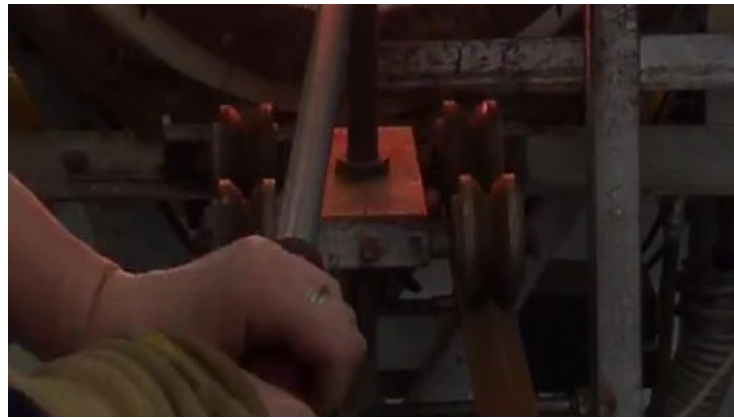


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Blown-mould process, 2019

Known the risk of failing, the designer was determined to experiment on a chandelier scale (Fig.58), based on the notion of lighting for two. In short, the glass shell is a hand-blown piece takes shape from a 2-parts blown-mould. For the moulding process, CNC machined wood mould was replaced by traditional plaster mould due to wastes (wood) caused by its large volume, by transferring the physical dimensions (curvatures) of lathed models into 3D modelling software, the shape within the final blown-mould was cast from a 3D printed model (Fig.53). This technology brings more than an accurate reproduction of the final shape, but also the material used in 3D printing (PLA, harder than plaster) enables a repetitive use in mould-making. Unlike the earlier moulding test, tools also need to be redesigned to fit the large-scale production, such as mould building walls and position securing keys (for joining moulds).



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~2 blowing process, 2019

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61 62 63

~2 Blown pieces for tabletop version, 2019

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Cold finishing glass, 2019



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Due to the lack of professional supports (number of technicians) in school glass department, most models are having unideal seam marks caused by the small diameter of neck within the mould (which did not support the rotation of glass in the mould, results in capturing the gap between the two-parts mould). A new plan was quickly set, which chandelier-scale ~2 would be outsourced producing in China while a tabletop version is developed in university studio.

The tabletop version of ~2 is an iterative result from the earlier practises. By reducing the scale, the technician could handle the glass easily when it is melting hot. In addition, in order to avoid previous rotation problems caused by small necks in moulds, the updated model tripled the diameter of openings at both ends. With a wide opening on both sides, the tabletop version created an interesting archetype without losing

the shared characters in chandelier/floor version (has a small opening on the sides). Even though the resulted surface is not perfect compared to glass lathing production, the models perform with much higher accuracy compared to the previous models. The cold-finishing process follows the steps of diamond-sole cutting, grinding, drilling and sandblasting. In addition, by reflecting on iterations, the final plaster mould was built with extra rooms on the neck and bottom, so that the final blown pieces could be easily cut and finished. (Fig.54)



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Through discussions with 3 professional glass manufactures based in China, a small glass lathing studio (Fig.65) was selected to produce the chandelier/floor ~2 in both transparent and sandblasted finishes. Known for the high accuracy and complexity, glass lathing is usually used in laboratory glass vessels. Based on a collective decision made with mould developers and glass craftsmen, a single lamp shell is moulded from 2 separated graphite moulds then hot fused on the lathe. Each part takes the form from a CNC milled graphite mould, which is reusable and industrially accurate. Comparing to the mould-blown pieces made in studio, the lathed glass piece has very smooth surface and accurate shape. (Fig.66)

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~2 glass lathing process, 2019
CZ glass lathing studio



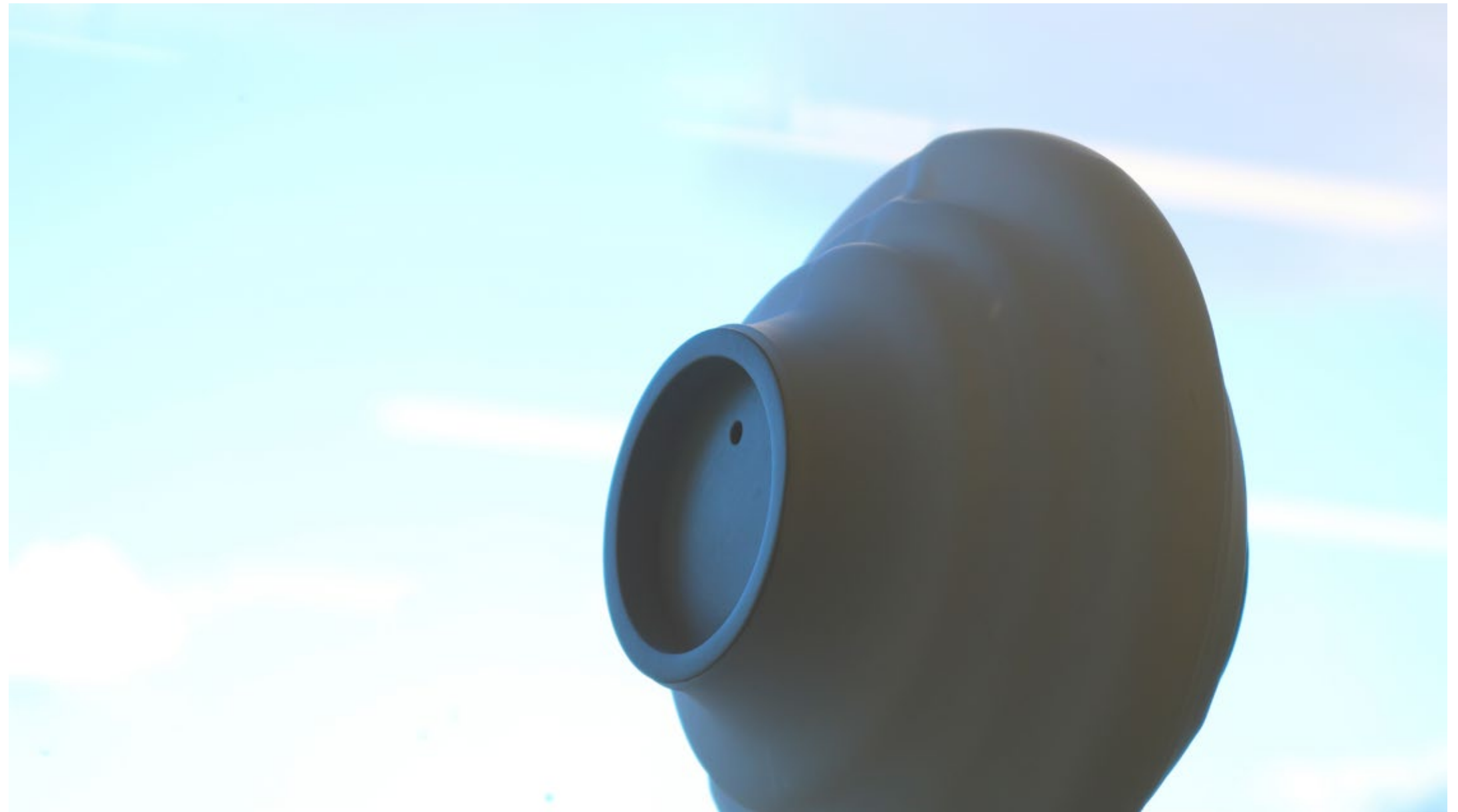
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~2 glass lathed model, 2019
made in China

Underneath the sculptural glass shell, there is a mechanical bracket designed for wind sensors, LEDs and metal supports. (Fig.71/73) All electronics boards and cables are hidden inside the metal base. In order to shape the focus to glass, the design of other parts focuses on reducing the visual element for audience and users, thus they are designed to be minimised (invisible) as well as supportive. All parts within the glass are made of industrial aluminum tubes and 3d printed ABS plastic. The aluminum tubes are proved to be lightweight and supportive during the test. The mechanical parts are proved better to be plastic rather than metal because of the softness of plastic protects the glass. Throughout iterations, I found that the glass has an uncertain internal thickness on the both openings, thus, I refined both bracket systems to 6 fixed parts and 2 variable parts. All parts are painted with Mable white, which matches the colour of glass with a low profile.

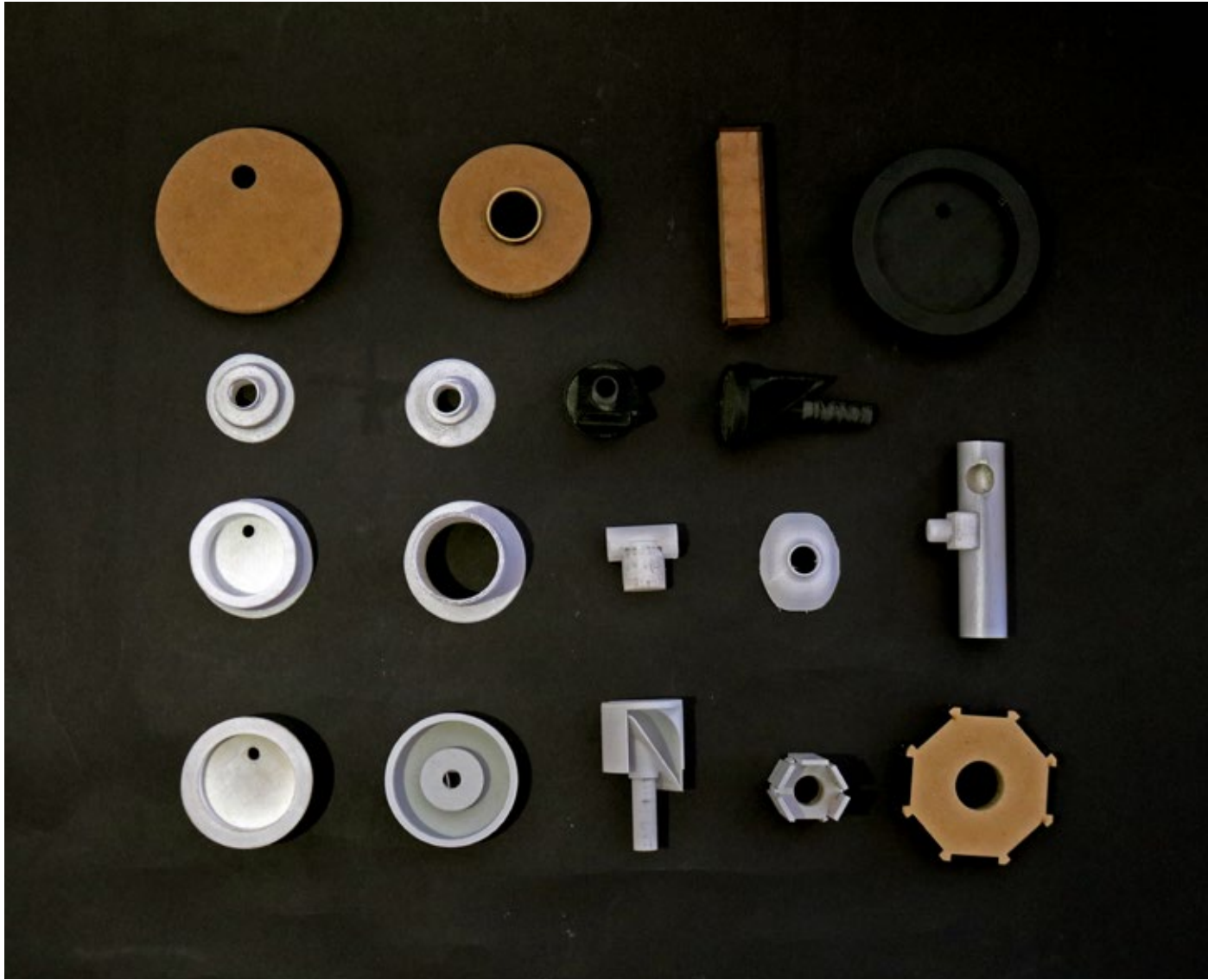
The base design was imagined to be invisible as well. In earlier models (Fig.75), I used layered MDF to create a minimised structure with enough rooms for Arduino board and cables. Besides, these models were considered travelling frequently, the base designs support the frequent action of assembling and disassembling. However, MDF is proved not strong enough to support the floor lamp. For the final prototype (Fig.77), I used plasma-cut layered steel to create enough weight with minimised volume. The material of the base shell is envisioned to be either oak or ABS plastic based on personal preference.



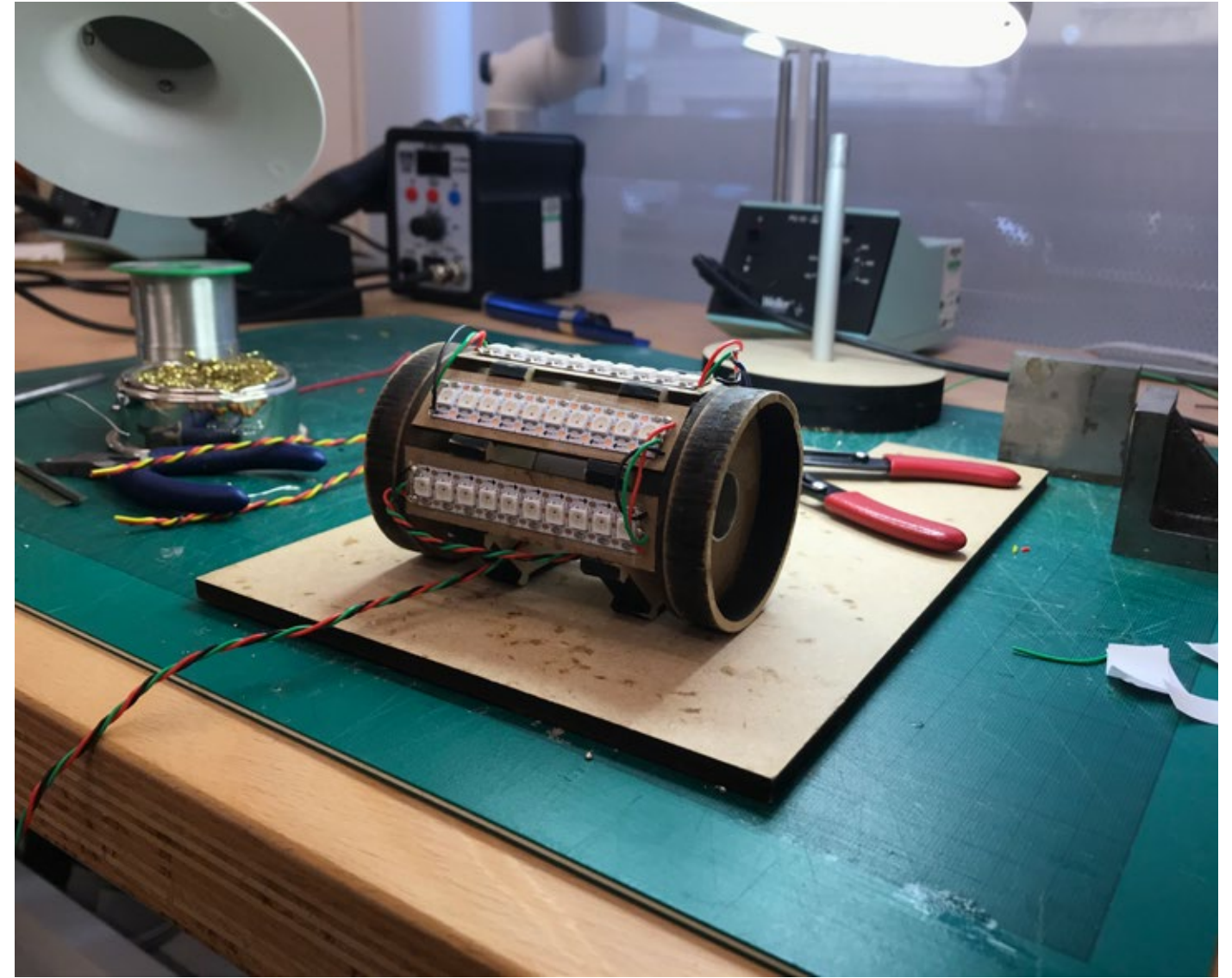
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~2 Tabletop detail on sunset, 2019
Sandblasted Glass with ABS part



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Mechanical parts iteration, 2019

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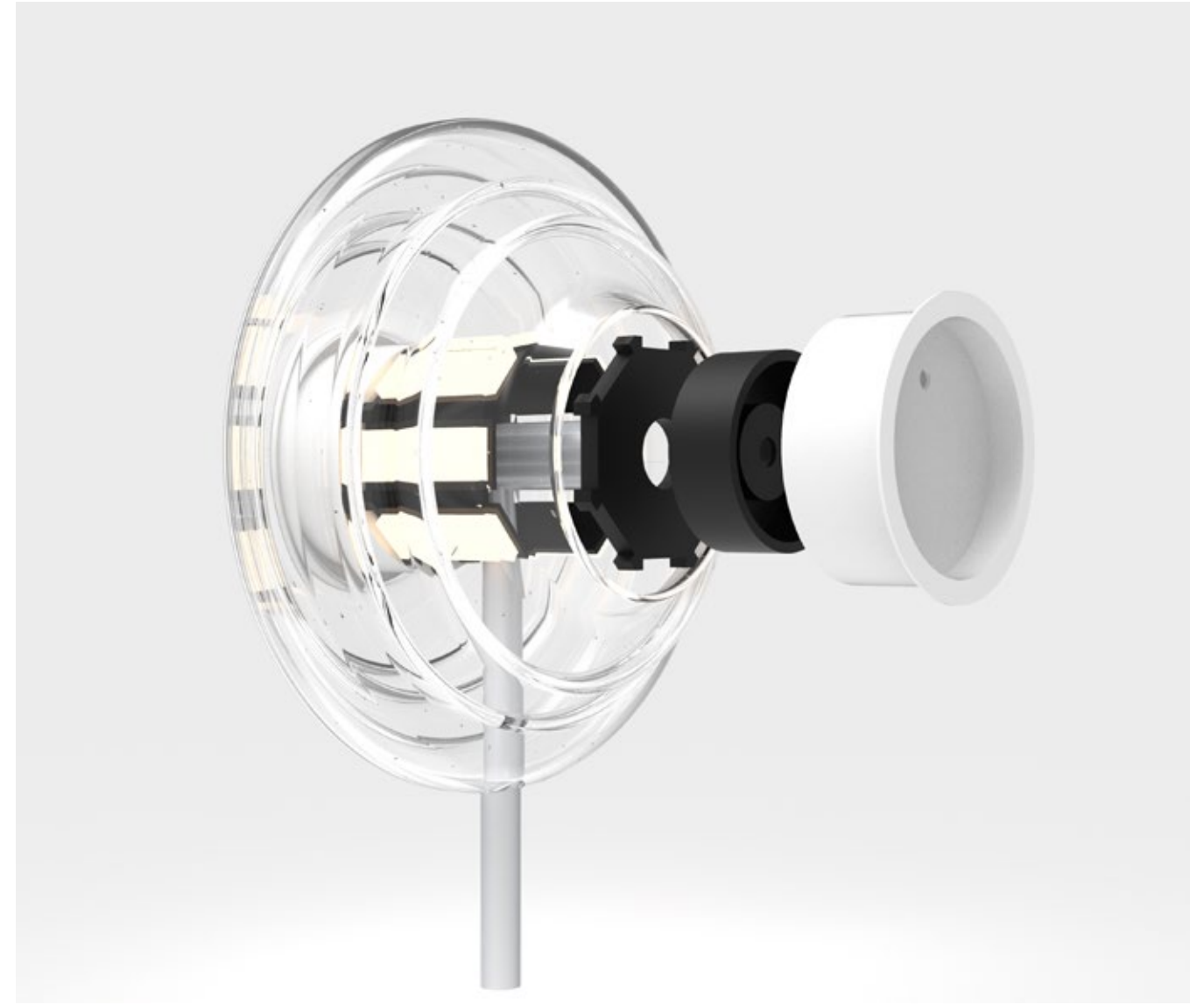
Tabletop LED assemble test, 2019



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~2 Tabletop lamp brightness test, 2019



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~2 Tabletop structure in CAD, 2019



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~2 Floor lamp brightness test, 2019



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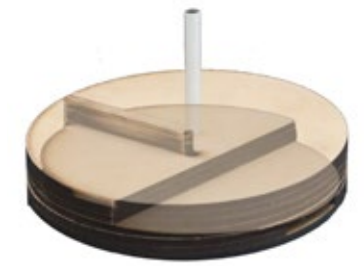
~2 Floor lamp structure in CAD, 2019



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~2 Floor lamp disassembled, 2019



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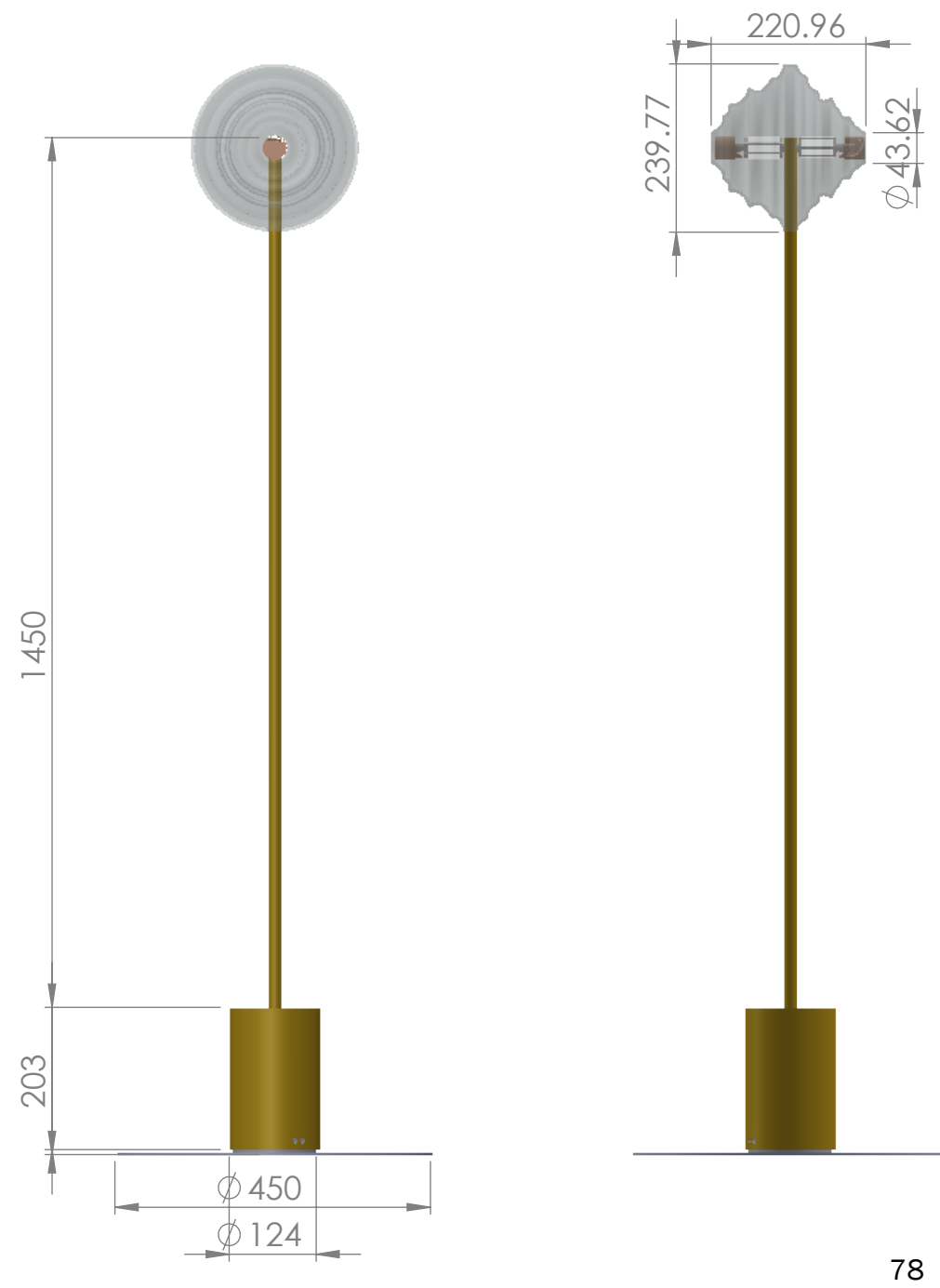
Tabletop base design, 2019
MDF

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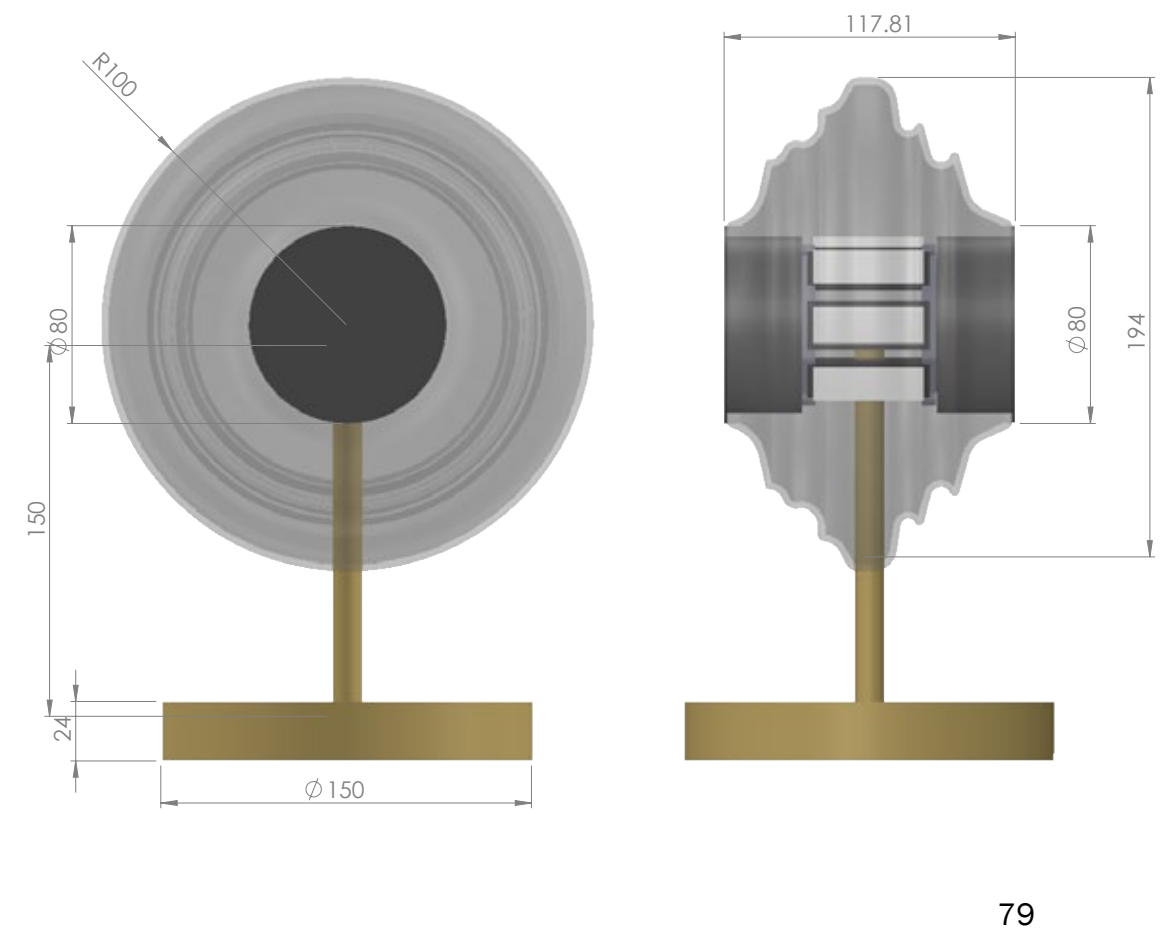
Floor lamp base design, 2019
MDF, plastic

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Floor lamp metal base, 2019
Steel, plastic



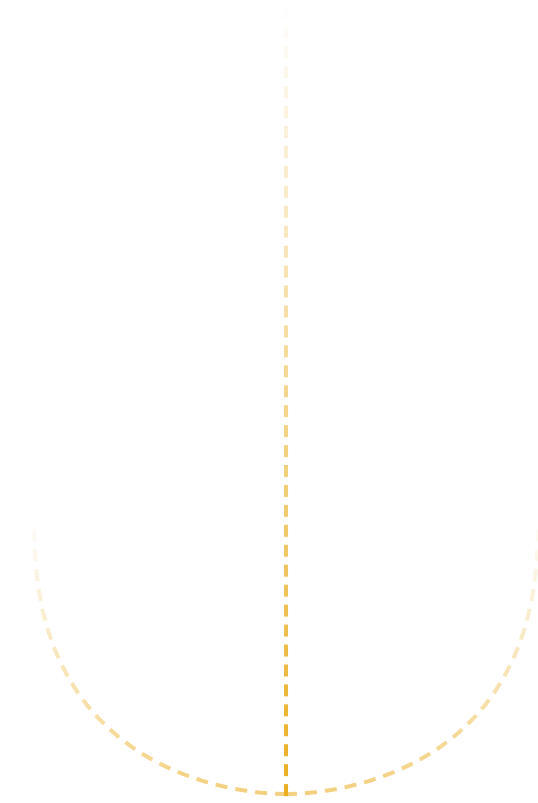
78
~2 Floor lamp Index, 2019



79
~2 Tabletop lamp Index, 2019



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Special thanks to Ingrid Phillips

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