A) **Cover Page**

Beyond Material Boundaries:
Applying the Overview Effect to Innovate Craft Practices.

Gazing down from the heavens above us to the earth below, with increasing concern and uncertainty for the planet's sustainable future, what might Craft and Design learn from the "overview effect' experienced by astronauts and space age materials and technologies?

This photo-essay case study presents how an appreciation of the possibilities of post-Anthropocene materials in contemporary jewellery design can be applied as an alternative approach to heritage materials and processes of making to both renew and sustain craft practices through innovative technologies.

Craft is being challenged economically, ethically, and environmentally, as supply chains become increasingly traceable, shining a light on social injustice and the impacts of extracting raw materials from natural environments, which are being increasingly questioned.

In an age of new 'out of this world' synthetic materials, recycled, manufactured, or grown to scientific purity, can we empathetically rethink our traditions for a more sustainable future beyond perceived boundaries?

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- Overview Effect
- Craft
- Post Anthropocene
- Space-Age
- Material-futures

B) **Pictorial Text:**

Pre-Launch & Countdown

‘The Overview Effect: Space Exploration and Human Evolution’ was written by Frank White in 1987 and describes a cognitive shift in awareness that can occur when someone sees the Earth from space with a sense of awe and responsibility for the planet that heralds a change of perspective and fresh approaches to barriers and problems. Shifting perspectives of Craft practice through technological advances has been an enduring research theme. This pictorial paper presents an exploration of how Craft and Design practices can benefit from the philosophical thinking afforded by the ‘Overview Effect’ (OE) through a personal investigation of the application of space-age materials and technologies between 2012 and 2024 (Figs. 1-14).

When attending the 2024 European Lunar Symposium (ELS) in Dumfries and Galloway, Tim Crain, Chief Technology Officer at Intuitive Machine, explained how “when you are on the Moon looking back on the earth, it is very difficult to see borders or boundaries”. Astronauts have repeatedly described how international collaboration in the extreme environment of space brings all nations together as one human race.

The OE lasting positive effects on individuals have been shown (Ritsher et al., 2005; Suedfeld et al., 2012), and the main effects are described as:

- Emotional responses led by an inclusive and overwhelming sense of beauty with a connection to the Earth and its diversity.
- Identity change or an individual’s sense of self-transcendence.
- Protective actions and a desire to protect the Earth's ecosystem.

Liftoff & Ascent

Craft can apply the Overview Effect as a trigger to design thinking and reappraise its connection to materials and techniques while considering a more sustainable approach to post-Anthropocene materials.

In the book ‘Radical Matter’, Franklin and Till describe their approaches to rethinking materials for a sustainable future when describing the ‘fruits of the Anthropocene’ and designers who “are beginning to consider not only the complications caused by vast ecological changes but also the potential” (p.220). The materials and fibres created for spacesuits to survive extreme environments in space are being adapted into everyday heat-resistant clothing, an important concern with the crisis of rising temperatures on Earth. The cost attributed to taking any object into space has equally led to the development of lighter and stronger materials, as well as the necessity for recycling and re-use beyond their first lifecycle, that can help inform our approach to how we use materials on Earth to their full extent.

Sustainability is a well-documented challenge for the crafts and some textile, metal, glass, and stone materials due to their means of production and supply. Precious metals and gemstones for jewellery design and manufacture can rely on high-impact mining and other destructive chemical finishing processes. Mining can require one tonne of rock ore to produce eight to ten grammes of Gold from a high-grade mine, and this is before various chemical purification processes, such as cyanide that poses a threat to the health of individuals and aquatic species, or other heavy metal pollution, such as mercury released during gold processing. (Domingues et al, 2024).

The price of precious metals and other gemstones has increased annually following the pandemic and other global economic challenges, reducing the affordability and sustainability of some crafts alongside these ethical concerns. (Cartier, L, 2019)

Contemporary makers are questioning past practices and seeking viable alternatives to how we make and value craft through sustainable systems, including recycling and the use of ethically sourced materials. The research and practice of two recent successful doctoral candidates, Boons (2024) and Kunning (2024), have revisited historical industrial precedents, like crystal growth and electroforming technologies, with sustainable and creative agendas. Boons has described how the manufacture of synthetic gem crystals matches the composition of those made organically and argues it has been purposely marginalised due to careful control and marketing measures by parts of the jewellery industry. Kunning reflects on the example of gold recycling from e-waste technologies recently applied by the 2020 Tokyo Olympic Games, reliant on public donations of old electronic devices, explaining that despite the sustainable re-use of a precious metal, some public opinion held that the gold was tarnished by being reclaimed from discarded mobile phones and other devices. Despite these pre-conceptions, in the United Kingdom, the Royal Mint has worked collaboratively with the Canadian cleantech company EXCIR to establish the UK's first factory set up on an industrial scale to process Printed Circuit boards to extract gold in 2024. (Stirling, W, 2023). The Royal Mint anticipates processing up to 4,000 tonnes of PCBs each year and up to 450 kg of gold, worth over £30 million at January 2025 prices. (Royal Mint. 2025)

Orbital Operations & Mission Objectives

Reflecting over the past two centuries, alternative materials have developed through improved industrial processes and scientific enquiry. Aluminium, though the most abundant metal on Earth, was once more precious than gold as science could not refine on an industrial scale until after the first industrial production by French Chemist Henri Étienne Sainte-Claire Deville in 1856. Aluminium's characteristics make it ideal for industries such as Architecture, transportation and electrical products.

The need for a designer-led shift away from a traditional value system, epitomised by precious metals and gemstones almost exclusively mined from the Earth to alternative possibilities offered through science and technology is evident. Alternative approaches to creation and sourcing that lie in the peripheries of design. This researcher approached these 'new' materials of the last century with traditional goldsmithing techniques associated with the craft for millennia, which the craft had developed for precious metals or gemstones before these post-Anthropocene materials became available.

Candy, Edmonds, and Vere (2021) have identified that research questions can arise as part of the process of practice, and the answers to these questions presented can contribute to the advancement of knowledge and the development of practice. They note the production of new artefacts, accompanied by a contextual analysis and a documented process, is often a distinctive characteristic of practice-based research. In the presented practice-based research, new knowledge is explored through the speculative use of new materials (synthetically grown Silicon) and reaction to traditional heritage techniques (vitreous enamelling) and framing with new technologies (sintered Aluminium). It is framed in established methodologies of making and an approach to the meaning of knowledge through practice in art and design research.

"The creative use of research for developing a new reality is quite unlike the understanding of traditional (scientific) research in that it investigates what could be rather than what is".
(Niedderer 2004a: 26).

Cruise Phase

The photographs in this essay present visual vignettes, manoeuvres of making in a post-Anthropocene era / event, through the lens of the research practice of contemporary jewellery working with alternative material choices.

Work is presented from 'Satellite', a solo show at the Museum Reich der Kristalle, part of the Mineralogischen Staatssammlung in Munich, that accompanied the international 'Moon Impact' exhibition (Caracas R, CNRS/ENS, Lyon) that presented models of the 'Giant Impact Theory' (Hartmann & Davis) during the 2024 Munich International Jewellery Festival. (Figs. 4 to 7).

The alignment of these two shows, one earth-science and the other craft, in the same museum, was coordinated by Deputy Director Dr Melanie Kaliwoda and provided an interdisciplinary experience that combined Science, Technology, Engineering and Mathematics (STEM) with 'Art' to create 'STEAM'. Selected works were then presented later in June 2024 at the European Lunar Symposium (ELS) public event, 'the Solstice seminars,' held mid-way through the Open University Crichton Campus conference. (Fig. 12).

The jewellery works presented within Figures 1-14 include close-up object details, alongside pictured exhibition displays, and are listed to describe the range of materials used as well as these jewels exhibited journeys. The material choices are extensively derived from the Aeronautics and electronic industries, contemporary to the Space Age, and at a time of significant environmental change to our planet and exploration of future other ones. Materials include sintered powdered Aluminium frames (Fig. 8), sliced purified grown Silicon boules for the circuit boards (Fig. 9) and foamed Copper for the rocket engines and heat exchangers (Fig.11). The pure silicon discs are grown synthetically as a single crystal boule in a laboratory facility and are central to integrated circuits in the electronic industry. The ones used in the 'Collider' 2023 brooches (Figs. 5+10) have been made in Munich and sourced by the Mineral Museum. A series of test pieces show the vitreous enamel stencilled onto the surface of the silicon discs and fired in the kiln up to 900 degrees Celsius.

Orientation & De-orbit

Discarded off cuts of electronic waste resulted from 'Urban mining', a term credited to Professor Hideo Nanjyo of Tokyo University Research Institute of Mineral Dressing and Metallurgy in the 1980s. Urban mining is recovering and reusing valuable materials from waste, such as electronics, concrete, bricks, steel, roofing materials, copper pipes, and aluminium. The tacit knowledge of craft and its past customs are adapting through changing times, and the 'Post Anthropocene' offers a powerful lens through which to view future design practice. The work shown builds on past practice exploring the fusion of vitreous enamel with space-age materials, such as NASA rocket engine Copper-Foam (Fig. 10), a practice described in the review by Nantia Koulidou of the exhibition, 'Space/Craft. 2019' at the Birmingham School of Jewellery Vitt Street gallery, that featured work from that decade. "Traces of his (Bottomley's) craft practice offer numerous answers on how he copes with changes in space and time by questioning the connection between what is familiar and rather traditional and what is unknown or rather new." (Koulidou. 2019.)

The 'Collider' brooches are made of silicon discs that have had vitreous enamel applied to them. (Fig. 6). They are set within an aluminium frame designed by CAD and sintered directly into aluminium. (Figs. 8+9). The silicon discs have had enamel sifted onto their surface. (Figs. 5, 6+10). These scattered particles of ground enamel, when fired at circa 900 degrees C, either fuse and bond or resist and spring away, leaving only their starry marks of passage. The silicon does not always accept fusion under the heat of all the particles of vitreous enamel. The surfaces thereby reflect both a successful fusion of enamel particles and the motes and traces of those rejected as part of the tension of this disruptive process. The results create objects that reference the beauty of the deep space telescope images with which we have become familiar. These lenses lens have demonstrated a creative, practice-based response and means to provoke debate (Fig 16).

Re-entry & Touchdown

These jewels collectively embody the disruption of applying traditional craft technologies to Space Age synthetic materials that were neither invented nor intended for them. The unknown, or uncanny, is never and should never be constant or predictable, but rather a context and territory for asking unfamiliar questions to expand research-creation. Loveless, in her book "How to Make Art at the End of the World", frames these concerns as 'affective discomfort' and invites us "to question what it means to answer (and ask) a (research) question from within disciplinary boundaries that are never (fully) our own".

The visual body of craft practice featured below demonstrates that in an age of new 'out of this world' synthetic materials (recycled, manufactured, or scientifically grown), it is possible to overcome perceived boundaries and rethink traditional approaches while exploring shared sustainable futures from a more expansive overview perspective. Peter Dormer described how, "Knowledge is expanded and its value demonstrated and tested, not through language, but through practice" (Dormer, 1997, p. 219). The Anthropocene epoch/event challenges us as designers and makers to reconsider research creation as an epistemological and methodological intervention to established scholarly traditions within craft. In doing so, we are encouraged to take greater responsibility for the consequences of our past inventions and practices, and for their significant impact on the planet's climate and ecosystems.

The appliance of craft approaches to radical space matter has elicited both an intuitive and emotional response through their design and creation. Untested reactions and unknown consequences involved instinctive responses to their making and embraced uncertainty. Each piece was an experimental, unique moment that revealed its own unexpected beauty as space-age materials collided with traditional techniques of an ancient craft. Vitreous enamel, a traditional material, bonds via its ceramic constituents to silicon discs or rocket engine parts, whose thermal heat exchange qualities then enable the fusion of unexpected visitors, as evidenced by the applied gold granules and diamond dust that create star-like surfaces on the Heat Exchangers brooches (Figs. 11 +14). Craft is empowered to break free of the gravity of historic convention, to behave differently in redefined atmospheres and create a beauty of another order for the eye of a new beholder.

The Overview Effects, previously listed at the beginning of this journey, offered a range of positive enhancements, as described by Ritsher et al. Considering these in relation to the creation of the jewellery practices presented is a revealing moment for re-entry and landing. The maker, through this process of exploration, also undergoes identity changes, back and forth, from Craftsperson to Material Scientist as they become a voyager in a brave new world of exploration. Material hierarchies are challenged and reconfigured, and awareness of the failing resources of an overworked planet becomes clearer and more mindfully considered in a process of self-transcendence.

Moves towards developing resilient futures for our world are achievable through the exploration of the peripheries of design, best viewed through the new perspectives provided by alternative lenses that can provide useful oversight. Key lessons when considering these relationships between available radical or space-age materials and technologies, is an alignment with more sustainable interdisciplinary practices, such as recycling or designed re-use. These are the necessary means to gain orbit and then return emboldened, establishing practices that positively protect resources and support future life on Earth.

Recycled materials, beautiful in their variety and historic and industrial complexity, and revalued for their synthetic beauty and form, create a new precious order, one open to collaboration and potentially beyond frontiers.

C) Notes, References and Acknowledgements

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D) Bio

Stephen Bottomley is Professor of Jewellery Culture and Innovation and the head of the School of Design at the Glasgow School of Art, Scotland, United Kingdom. His practice-based and led research interests are contemporary jewellery, enamel and metalwork. An internationally exhibited maker, his work is in the National Museums of Scotland, the British Museum and the Cominelli Foundation Collection Italy. Scholarly work explores heritage jewellery techniques with evolving and contemporary materials and technologies that seek to analyse and extend the boundaries of traditional craft practices. Exhibitions he has curated include events in Chicago, Lake Garda, Beijing, Shanghai and Munich; these, alongside interdisciplinary projects and research groups, champion experimental research-creation and sustainable craft practices.

E) Images/ Pictorials

Figure 1

Figure 2

Figure 3

Figure 4

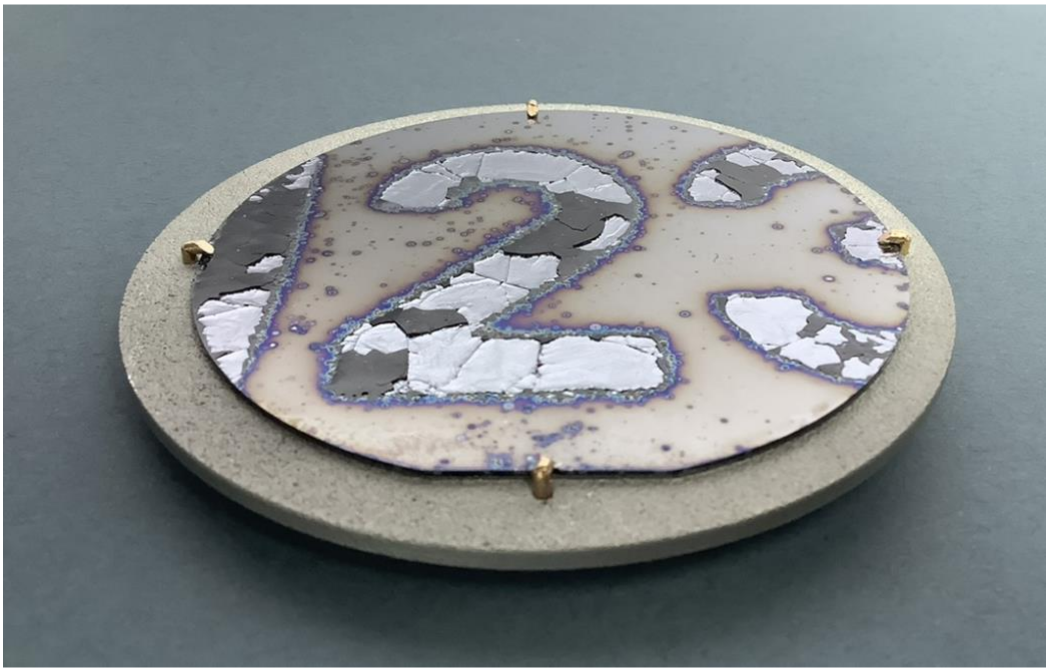

Figure 5

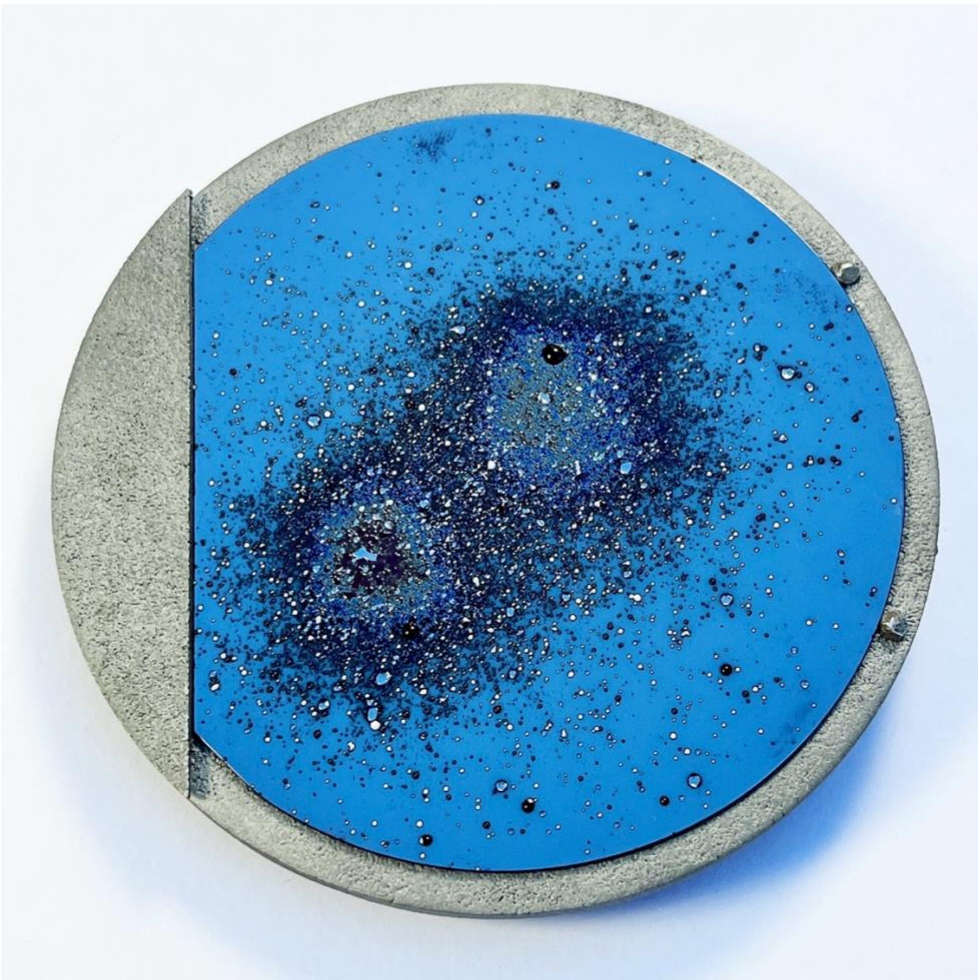

Figure 6

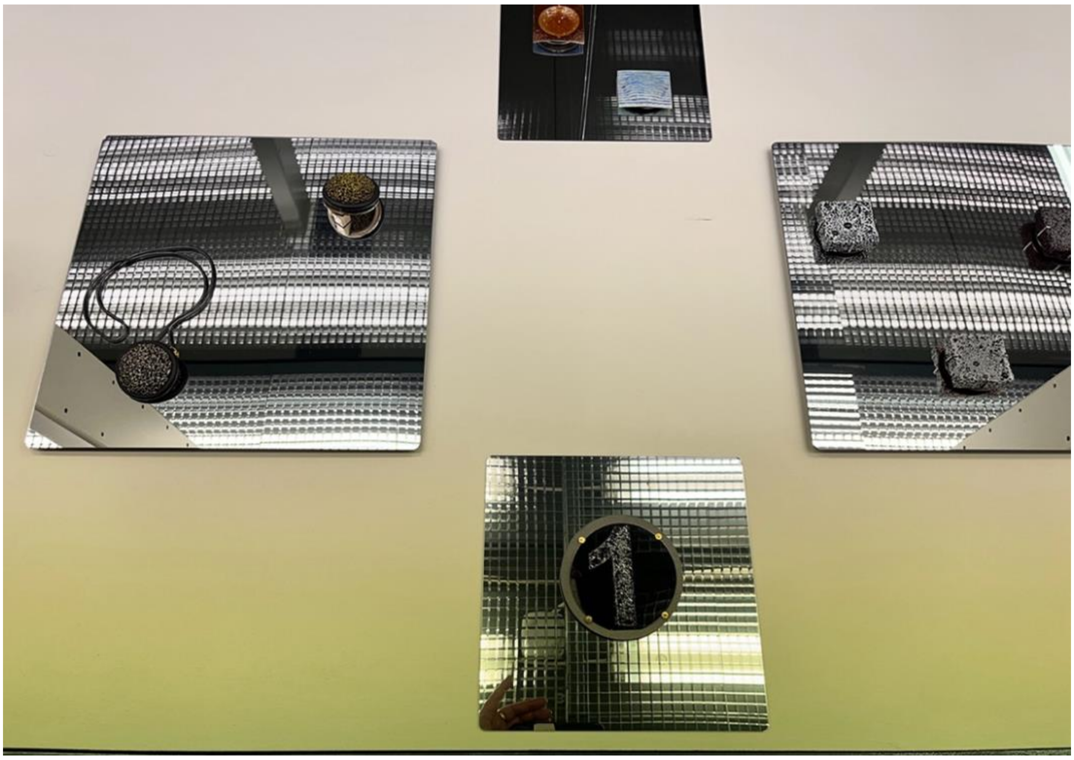

Figure 7

Figures 8 + 9

Figure 10

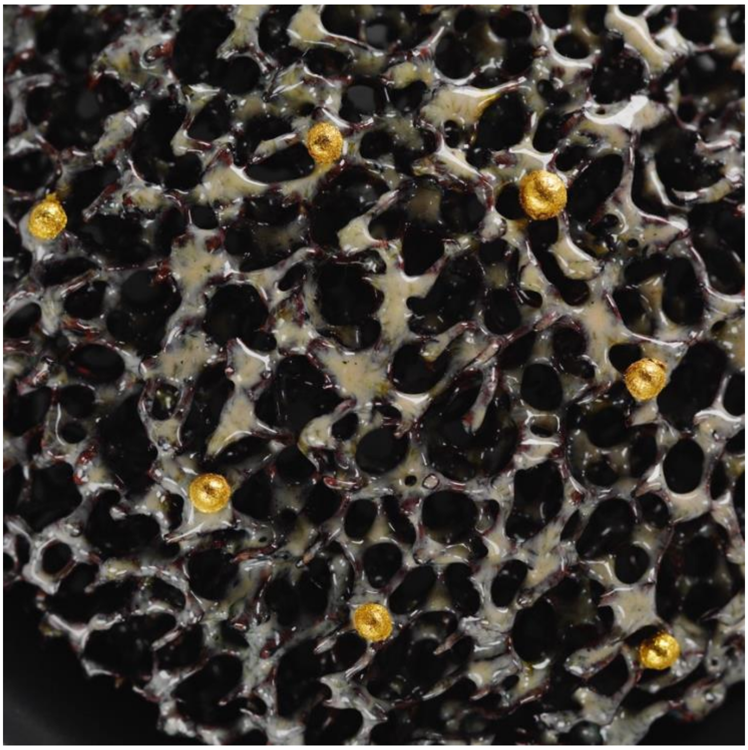

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 1
A Setting Earth (April 6th, 2026)
A view from the Artemis II Lunar flyby as the Orion spacecraft and crew moves behind the moon, loosing contact with Earth for 40 minutes.
Producer: JSC
NASA image credit Public Domain

Figure 2
Earthrise (1968)
Photo of the Earth taken from Apollo 8
Photo Credit Bill Aders NASA -
NASA image Public Domain

Figure 3
‘Have Fun at the Exhibition’ (2024)
Bottomley speaking at the ‘Moon Impact’ (Caracas R, CNRS/ENS, Lyon) and ‘Satellite’ Exhibitions opening, Museum Reich der Kristalle, Mineralogischen Staatssammlung, Munich.
Photo Credit Melanie Kaliwoda

Figure 4
Satellite exhibition (2024)
Entrance to the ‘Moon Impact’ (Caracas R, CNRS/ENS, Lyon)
Museum Reich der Kristalle, Mineralogischen Staatssammlung, Munich.
Photo Credit S. Bottomley

Figure 5
'1, 2, 3' Brooches (2023)
Silica, Enamel, Aluminium, Gold & Steel.
Photo Credit S. Bottomley (artist)

Figure 6
'Collider' Brooch (2023)
Silica, Enamel, Aluminium & Steel.
Photo Credit S. Bottomley (artist)

Figure 7
Vitrine display of eight brooches (2024)
Satellite exhibition, Munich.
Photo Credit S. Bottomley

Figure 8 + 9
Test pieces (2024)
Computer-aided designed 3-D printed prototype and sintered aluminium frame to hold silicon discs.
Photo Credit S. Bottomley

Figure 10
1-9 Test pieces (2024)
Silicon discs with stencilled vitreous enamelled numbers
Photo Credit S. Bottomley

Figure 11
Detail of Heat Exchanger (2024)
Enamel, Copper, Gold, Silver, Rubber & Steel, 2014
Photo Credit S. Bottomley (artist)

Figure 12
Display at the European Lunar Society Solstice Seminar (20th June 2024)
Crichton Memorial Church, The Crichton, Dumfries, Scotland. The Open University in Scotland with the Crawick Multiverse Trust.
Photo Credit S. Bottomley

Figure 13
Display 6 x brooches (2024**)**
Photo Credit S. Bottomley (artist)

(top) White & Black Exchanger, Brooch (2012)
Enamel, Copper (rocket heat exchanger metal), Bronze, Silver, Diamond & Steel.

(middle from left to right**)**
Great Expanse Exchanger, Brooch (2015**)**
Enamel, Copper, Bronze, Silver, Gold, Diamond & Steel
Collider Brooches **(**2023)
Silica, Enamel, Aluminium & Steel
Space Brooch, (2018)
Silver, Enamel, Faience, Mother-of-pearl & Steel.

(bottom)
Stellar Moss Brooch **(**2015)
Enamel, Copper, Silver, Rubber & Steel

Figure 14
Stellar Moss, Brooch (2015)
Enamel, Copper (rocket heat exchanger metal), Silver, Rubber & Steel.
Photo Credit S. Bottomley Simone Nolden

Figure 15
Bottomley**,** Planet pin, Brooch**,** 2023
Aluminium, steel and faience.
Photo Credit Simone Nolden

Figure 16
Surface Landing:
Enamel Materials &
Craft Expression.
Post-lecture Q&A
Guizhou Minzu University,
China, April 2026
Photo Credit SCFAI