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SUSTAINABLE ARCTIC PRODUCT DESIGN: OPPORTUNITIES FOR SNOW GLASS DEVELOPMENT WITH STUDENTS.

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ABSTRACT | One of the key challenges for the future of Arctic design is considering the highly sensitive environment and culture in the Arctic regions. The problem is how to design products in a more sustainable way in the Arctic context. To achieve this, designers need education, skills, and support to create socially and environmentally responsible products (Lofthouse, 2017). Arctic design creates products, services, and systems addressing the unique environmental conditions of the Arctic regions. It centers on a commitment to sustainability and a deep respect for the delicate Arctic environment (Häkkinen & Johansson, 2018, p.33). This examination contributes to the broader discussion on sustainable systems design, particularly tackling challenges posed by climate change.

This study delves into the specifics of Arctic product design, exploring the intersection of nature-based solutions in the potential of snow glass development. The study contributes to the conference's overarching theme, envisioning a harmonious synergy between human creativity and the resilience and opportunities of the Arctic ecosystem. The focus is on designing products within the Arctic context, emphasizing the importance of sustainable design practices and the role of students in shaping the future of Arctic product design.

Firstly, the University of Lapland's Art and Design students (n=184) were surveyed from 2021 to 2023, aiming to understand their insights on Arctic product design and potential future directions. Results show how these products embody authenticity and responsibility through a profound appreciation for nature and sustainable materials. Nature's conditions are an important part of Arctic product design, where Arctic materials such as snow can be used in different stages of the design process. In the second part, Arctic glass design was explored, emphasizing its potential for integration with sustainable materials. *Arctic glass design is a specific field within the realm of art and design that focuses on the innovative application of glass, incorporating distinctive characteristics and elements related to the Arctic.* The study unveiled numerous possibilities to incorporate, e.g., snow into the glass design process. Thirdly, respondents' insights were gathered on the use, features, distinctions, challenges, opportunities, and definition of an innovative glassblowing technique, snow glass. These perspectives improve understanding when using snow in Arctic glass design. *Snow glass is defined here as a type of glass that is shaped and manipulated in different ways with snow during the hot glass working process.* The term does not, therefore, refer to the aesthetic qualities of glass, such as aiming to resemble the appearance of snow.

The findings reveal that perceptions of Arctic product design are strongly associated with nature and emphasize sustainable and responsible qualities integrated with durable and functional designs. To develop Arctic product design, we need to sustain Arctic materials for the future. Therefore, when aiming for sustainable Arctic product design, it is essential to minimize climate impact, ensure resource efficiency, respect cultural aspects, and meet demands for environmentally responsible products. Applying Arctic materials such as snow in suitable product design processes can meet these demands. This study sparks ongoing dialogue, promoting further investigation into the possibilities of snow glass.

Sustainable Arctic Product Design

One of the key challenges for the future of Arctic design is considering the highly sensitive environment and culture in the Arctic regions. The problem is how to design products in a more sustainable way in the Arctic context.

Arctic product design adjusts contributions to the unique environmental aspects of the Arctic, striving to develop resilient, sustainable and culturally fitting solutions.

One way to affect the future of a more sustainable design is through design education. This study underscores the significance of sustainable design practices in the Arctic, with a particular emphasis on students playing a crucial role in shaping the future of Arctic product design.

The exploration of nature-based solutions aligns with the broader theme of envisioning a harmonious synergy between human creativity and the resilience of the Arctic ecosystem.



1. Reindeer antlers pressed on hot glass form a supportive structure for the fragile Arctic flower. Glass design symbolizes the connection with nature. Kannatella (*Cherish*), design by Milla Johansson (2023).

Arctic Product Design: A User Study with Design Students

Students' perspectives enrich the viewpoint, align with future visions and foster a more inclusive and forward-thinking approach to Arctic product design. University of Lapland's Art and Design students ($n=184$) were surveyed from 2021 to 2023 to understand their insights on Arctic product design.

"In the future, sustainable development and recycling should be considered in Arctic product design. When utilizing raw materials from nature, consideration should be given to their availability also in the future." A design student's response.

Respondents emphasize the use of natural materials and sustainable manufacturing methods in Arctic product design. Nature's conditions are an important part of Arctic product design where Arctic materials such as snow can be used in different stages of the design process. Snow's unique qualities contribute to various stages of the Arctic product design process and serve as a source of inspiration for creative and sustainable product designs.



2. Glassblowing mold can be refined by examining the shape with snow. Design by Milla Johansson (2024).

Arctic Glass Design

Arctic glass design, as a facet of Arctic product design, is intricately linked and grounded to the overall research areas of the University of Lapland. Arctic glass design has been examined through diverse perspectives in various design student projects during 2020-2024.

Arctic glass design is a specific field within the realm of art and design that focuses on the innovative application of glass, incorporating distinctive characteristics and elements related to the Arctic.

Sustainable Arctic materials, uniquely linked to the region, are responsibly sourced, produced and utilized with features like renewability and recyclability, contributing to the creation of environmentally friendly products.

This versatile study explores the opportunities and concretizes the topic with the Arctic glass design case, where design students collaborate with artisan students.



3. Snow forms distinctive surface patterns on glass. The potential of snow glass in artistic works is clear, but it might also be suitable for small series products. Kaltio, design by Milla Johansson (2023).

Snow Glass

The potential of incorporating snow into glass design within the Arctic context, offers an intriguing intersection of unique and experimental technique linked to Northern nature. Variables such as air and surface temperatures, moisture levels and snow crystal shapes impact snow texture and overall quality and are crucial considerations in snow glass design. This research aims to initiate a discourse regarding the categorization of snow glass as a novel and distinctive glass technique.

Snow glass is defined here as a type of glass, which is shaped and manipulated in different ways with snow during the hot glass working process.

Water typically creates crackled patterns to glass, but contrasting imprints arise when compared to those made by snow. Furthermore, unlike water, snow shape can be controlled and formed into a specific, detailed form repeatedly.



4. Snow glass creates vivid and unique shadows. Here, the term "snow glass" does not refer to the aesthetic qualities of glass, such as aiming to resemble the appearance of snow. Design by Netta Kandelin (2023).

Snow Glass: A User Study with Design Students

Empirical data was collected to integrate snow into glass design by examining trends, challenges, and opportunities to lay the groundwork for further exploration. Hands-on experiences were facilitated through practical design sessions where tests were done with snow to provide insights into the creative potential of snow in glass design.

Snow can be used in several stages of the glass design process, in diverse manners:

- creating ideas and finding shape;
- prototyping and mold making;
- user testing;
- glass manufacturing process.

Aspects to consider when making snow glass:

- quality of snow, influenced by various elements; temperature, humidity, texture and structure
- quality of glass; temperature and thickness;
- time and timing; duration and stage of contact between snow and glass;
- movement; controlling the interaction between glass and snow in different ways;
- finishing; snow effects are either retained or smoothed through glass reheating.



5. Different pattern effects can be achieved by controlling the technique of applying snow to hot glass. The traces can vary to be e.g. lichen-like or sequin-like. Design by Milla Johansson (2023).

Glassblowing with Snow: A User Study with Experienced Participants

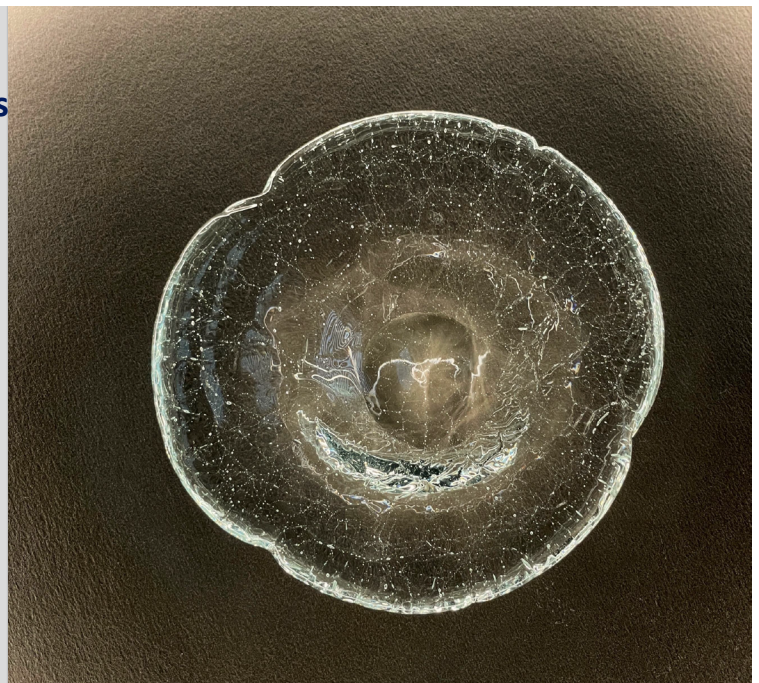
Thirdly, a supportive survey was conducted for artisan students and glassblowers who had experimented glassblowing with snow. The aim was to inquire their experiences regarding:

- exploring perspectives on snow glass qualities;
- distinctions from other glass types;
- potential challenges or opportunities for the future of snow glass.

With a limited sample size, the results offer preliminary insights to spark discussion. Overall, respondents employed snow in various glassblowing techniques:

- both within and outside the glass;
- by sprinkling snow onto the glass piece;
- pressing or embedding objects into snow;
- incorporating snow within blown pieces;
- using snow as a mold.

Overall, snow glass is portrayed as an intriguing approach to glass design, offering visual appeal and potential symbolic significance.



6. Quality of snow and techniques through which snow interacts with glass are evident in the characteristics of glass. Powder snow markings. Design by Netta Kandelin (2023).

Discussion

Nature plays a crucial role in sustainable Arctic product design, requiring minimal climate impact, efficient resource utilization, cultural respect and environmental responsibility. The overarching goal is to create ecological products tailored for Arctic environments while considering user needs and product quality. Engaging design students in research activities parallel with ongoing courses benefits both education and research.

Snow emerges as a key Arctic material offering unique properties conducive to design innovation, particularly in glass design. Snow's versatility in design processes, as an alternative to environmentally harmful materials, highlights its potential for more sustainable product development.

Snow possesses unique qualities, allowing the creation of designs that might be unattainable with other substances. Moreover, snow glass signifies a harmonious union of natural materials and contemporary design practices, representing a fusion of tradition, innovation, and sustainability, paving the way for future explorations in Arctic design.



7. Reindeer antler and snow as mold parts. Arctic product design can contribute to sustainable development while maintaining cultural authenticity with locally sourced materials and eco-friendly methods.

Future Perspectives

The future of sustainable Arctic product design hinges on navigating the distinctive challenges posed by the region's delicate environment and culture. It must prioritize cultural sensitivity and environmental issues with resource scarcity.

The discourse surrounding Arctic glass design underscores the significance of further exploration in this area. Snow emerges as a promising yet underexplored medium in glass design, offering unique capabilities and distinct qualities.

We advocate for the development and examination of Arctic product design through the lens of Arctic glass design with particularly the snow glass technique. This study serves as a catalyst for ongoing dialogue, paving the way for continued exploration into the possibilities of snow glass.



8. Snow glass has captivating opportunities to create unique shapes, patterns and surfaces. Kaltio, design by Milla Johansson (2023).

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Figures

1. Kannatella (Cherish). Picture by Juuso Kiviniemi (2024). Glassblowing by Silja Skoglund, Markus André Eriksen, Astrid Elise at Glasshytta Blåst in Tromsø, Norway. Supported by Taiké.
2. Glassblowing mold. Picture by Annu Kuivas (2024).
3. Kaltio. Picture by Elli Alasaari (2023). Glassblowing by Elina Reinola, Julia Öhman, Nikke Relasi, Paula Hjelt, Kirsti Doukas and Marika Kinnunen.
4. Snow glass shadows. Glassblowing and picture by Netta Kandelin (2023).
5. Snow glass patterns. Pictures by Milla Johansson (2023). Glassblowing by (right) Eija Yli-Knuuttila, (left) Elina Reinola, Julia Öhman, Nikke Relasi, Paula Hjelt, Kirsti Doukas and Marika Kinnunen.
6. Powder snow glass. Glassblowing and picture by Netta Kandelin (2023).
7. Reindeer antler and snow as mold. Design by Milla Johansson. Picture by Sami Mikkola (2023). Glassblowing by Marika Kinnunen.
8. Kaltio. Picture by Elli Alasaari (2023).

Profile picture by Juuso Kiviniemi (2023).



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