

HOW HAS A HEXAGONAL SNOW CRYSTAL BEEN ARRANGED ON SCIENCE AND DESIGN ?

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Abstract: When a hexagonal snow crystal is drawn or designed, the arrangement of it is divided broadly into two types; horizontal or vertical arrangement. The horizontal arrangement of a snow crystal design is very often seen in the US under the cultural influence of Bentley's book "Snow Crystals" in which over two thousand photomicrographs of hexagonal snow crystals are arranged horizontally. On the other hand, the vertical arrangement of a snow crystal design is very common in Japan. This tendency is affected by Japanese traditional cultures; vertical arrangement of hexagonal family crests, vertical writing of formal Japanese, etc. The popular arrangement of a snow crystal design in a country is, therefore, considered to reflect own culture of that country.

KEYWORDS: snow crystal, arrangement, W. A. Bentley, snow culture

1. INTRODUCTION

When a hexagonal snow crystal is drawn or designed, the arrangement of it is divided roughly into two types (Fig. 1). One is vertical type; one of three symmetry axes of snow crystal is set vertically. The other is horizontal type; one of three symmetry axes of snow crystal is set horizontally. Key axes of these two types are a vertical axis and a horizontal axis respectively as the other axes are all inclined.

The popular arrangement of a snow crystal on design, sketches and microphotographs differs from one country to another. So authors examined what this difference is connected to.

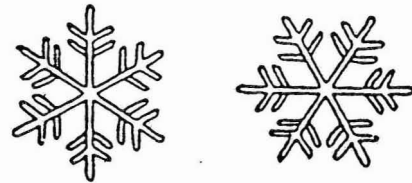


Fig. 1 Vertical arrangement (left) and horizontal arrangement (right) of a snow crystal.

2. SNOW CRYSTAL ARRANGEMENT IN THE UNITED STATES

The horizontal arrangement of a snow crystal design is very often seen in the US. When ISSW'94 was held at Snowbird, Utah, authors noticed that almost all snow crystal designs had horizontal arrangement (Fig. 2). Typical example of horizontal snow crystal arrangement can be seen in Bentley's photomicrograph book "Snow Crystals" (Bentley and Humphreys, 1931). This book has over two thousand microscopic photographs of hexagonal snow crystals. All of them are arranged

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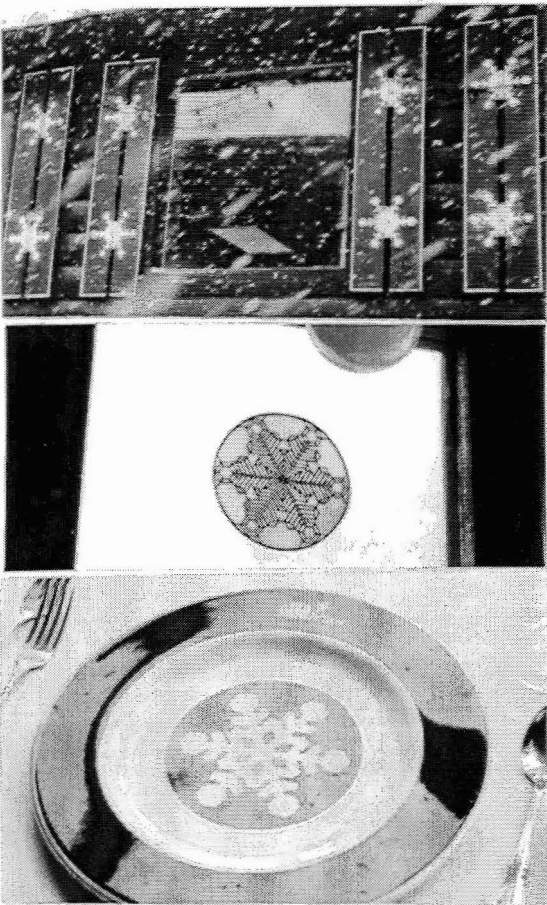


Fig. 2 Horizontal snow crystal designs in Utah, US.



Fig. 4 Vertical snow crystal designs in Japan.

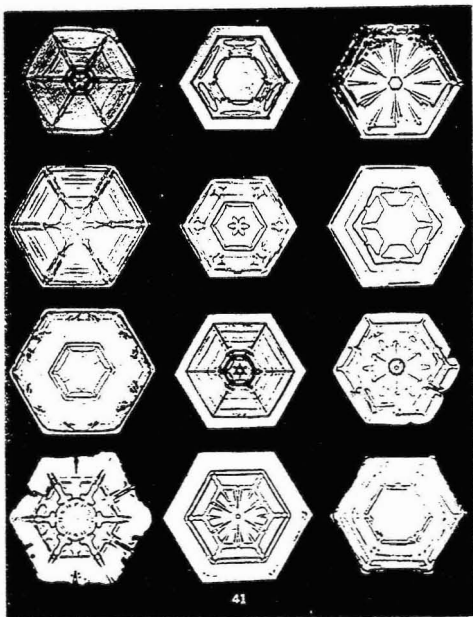


Fig. 3 Bentley's photomicrographs of hexagonal snow crystals.

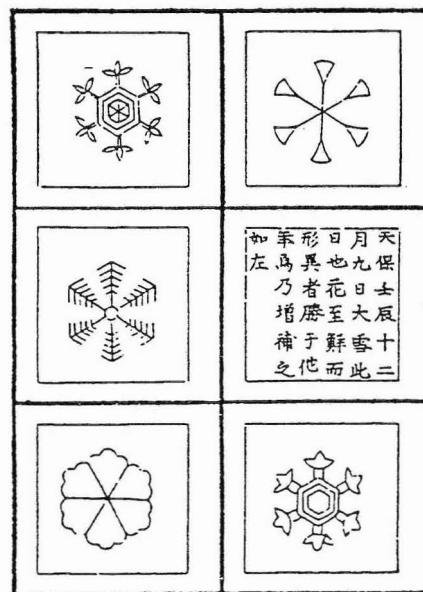


Fig. 5 Snow crystal sketches in "Sekka Zusetsu".

horizontally except only one vertical snow crystal (Fig. 3). This great book must have held strong cultural influence on the arrangement of a snow crystal design. It may be said that Bentley's book is a kind of American snow culture. So the horizontal arrangement of a snow crystal seems to have been in American subconscious.

3. SNOW CRYSTAL ARRANGEMENT IN JAPAN

The vertical arrangement of a snow crystal design is very common in Japan (Fig. 4). T. Doi, the lord of Koga domain, sketched snow crystals using a microscope and published "Sekka Zusetsu" (pictorial book of snow flowers) in 1833. In this book 86 snow crystal sketches are all arranged vertically (Fig. 5).

At present horizontal writing of Japanese is common in Japan, but traditional and formal writing of Japanese is vertical in the same way as Chinese. Sketching a hexagonal snow crystal, it's easy to begin to draw the key axis of snow crystal, which matches the formal writing direction of mother language. Therefore, T. Doi took the vertical arrangement of a snow crystal in his book "Sekka Zusetsu". After publishing of this book, his sketches were widely used as a fashionable design on kimonos, ceramics, tools, sweets, etc., in Edo, former Tokyo. They formed a kind of Japanese snow culture. And most of hexagonal family crests in Japan have traditionally had vertical arrangement from old times (Fig. 6). Owing to these traditional cultures, we can often see the vertical arrangement of a snow crystal design in Japan.

Dr. U. Nakaya who was the first to make snow

crystals artificially in the world started his snow crystal study under the influence of Bentley's work. Photomicrographs of natural snow crystals in his first English paper (Nakaya and Iijima, 1933) were arranged horizontally like Bentley's book. But, in the course of his snow crystal study, he must have become aware of Japanese traditional cultures mentioned above. He compiled all the snow crystal studies into a book "Snow Crystals: Natural and Artificial" (1954), in which most of photomicrographs of hexagonal snow crystals were arranged vertically (Fig. 7).

4. SNOW CRYSTAL ARRANGEMENT IN SWITZERLAND

In Europe, snow crystals had been observed and sketched from old times. Hexagonal snow crystals observed by R. Descartes (1637), R. Hooke (1665), D. Rossetti (1681) and A. Lindenman (1907) were almost arranged horizontally on their sketches (Fig. 8, 9). This horizontal arrangement is relevant to the alphabetical writing which proceeds horizontally, as the key axis of horizontal snow crystal matches the writing direction of alphabet. But the horizontal arrangement of a snow crystal design is not common in all European countries. In Switzerland, the vertical arrangement of a snow crystal design is often seen. Typical example can be seen on the mark of the Swiss Federal Institute for Snow and Avalanche Research (SLF, Fig. 10). It is considered that some other cultures have affected the arrangement of a snow crystal design. In Switzerland we can often see the vertical arrangement of hexagonal pattern; heraldic emblems, trade marks etc. (Fig. 10). It is only

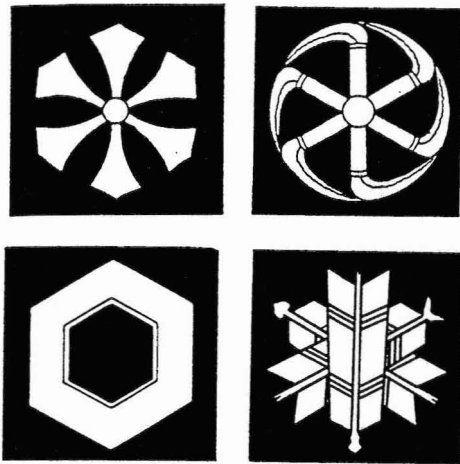


Fig. 6 Hexagonal family crests in Japan.

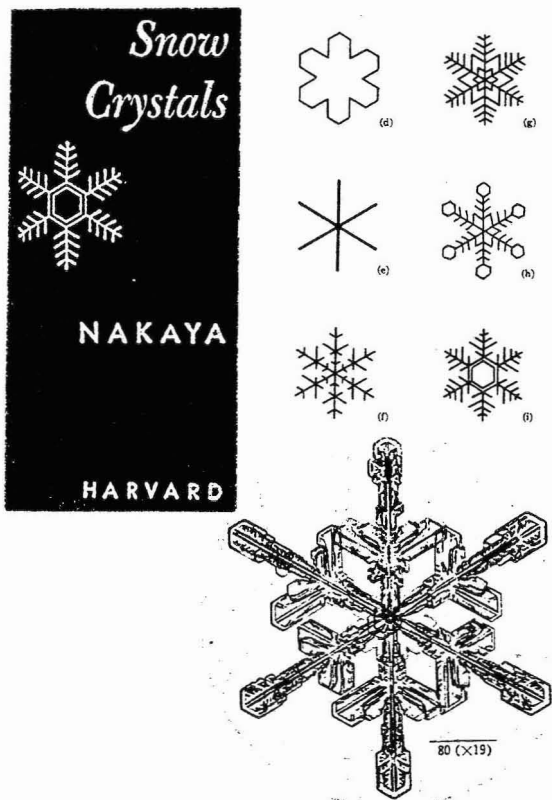


Fig. 7 Nakaya's snow crystal arrangements in "Snow Crystals: Natural and Artificial".

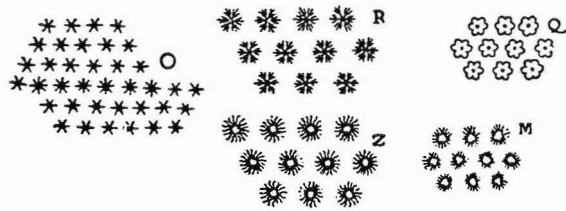


Fig. 8 Snow crystal sketch by R. Descartes (1637).

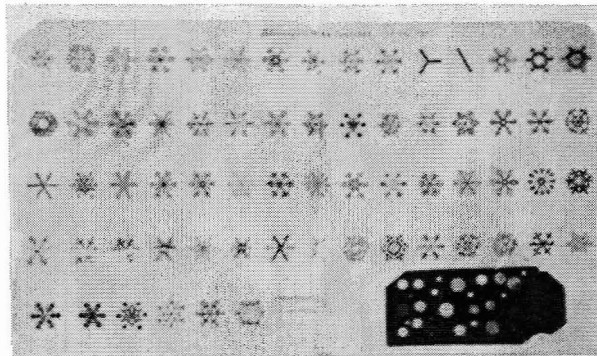


Fig. 9 Snow crystal sketch by A. Lindenman (1907).

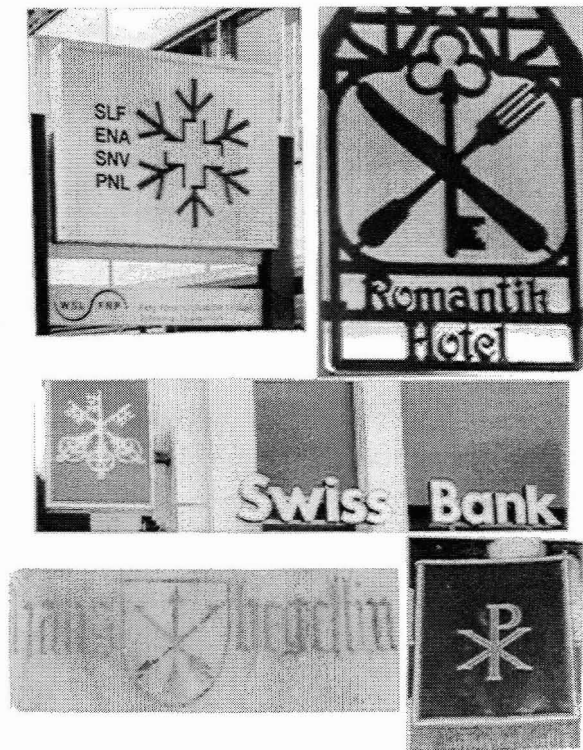


Fig. 10 Hexagonal emblems and marks in Switzerland.

natural that hexagonal snow crystal designs are often arranged vertically under these cultural influences.

5. CONCLUDING REMARKS

When a hexagonal snow crystal is drawn or designed, we arrange it mainly in two ways; horizontal or vertical arrangement. The popular arrangement differs from one country to another. The horizontal arrangement is popular in US. The vertical arrangement is very common in Japan and often seen in Switzerland. It is considered that the popular arrangement of a snow crystal design in a country reflects own cultural background of that country.

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