Fire Pattern – Frost Pattern
by Andreas Bick
Produced by Deutschlandradio Kultur
First broadcast 3 Nov. 2006 (*frost pattern*) and 8 Nov. 2007 (*fire pattern*)
Producer: Götz Naleppa
Length: 26:00 and 26:50 min.
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The sound compositions *fire pattern* (2007) and *frost pattern* (2006) describe the extremes of hot and cold. Almost identical in terms of their formal structure, the twin pieces reflect the acoustic impact of the energies unleashed by fire and ice, from the loudest sound event in each case – the eruption of a volcano and the collision of an iceberg – through to cooling or melting in a more moderate temperature range.

As elementary forces, fire and ice have always been used to symbolize opposites like passion and apathy, or change and rigidity. These extremes of hot and cold mark the borders of the intervening range of temperatures where life is possible. Nonetheless, human beings are magically drawn to these outer reaches of what they are capable of tolerating. Whereas Dante Alighieri saw sinners subjected to eternal punishment in seas of fire and ice, countless explorers later set off for hostile regions of Arctic ice deserts and volcanic landscapes in pursuit of this fascination. Such locations seem to epitomize this ambivalence of beauty and terror; some of the most violent forces of nature and the loudest sources of sound on Earth derive from volcanic eruptions and colliding icebergs. "*We call that sublime which is absolutely great, (...) what is great beyond all comparison.*" This is how Kant describes the experience of mighty natural forces, giving examples including overhanging rocks, thunderclouds, volcanoes and the boundless ocean. Nature becomes a treasure trove of metaphors, and our imagination projects archaic and romantic images into the remote marginal zones of our uncertain existence.

But what happens when we free fire and ice of these images, when we regain access to a state of awed listening and focus on the inner quality of hot and cold sounds? The English writer William Temple popularized a term that describes a fascination with unordered and random structures that unexpectedly lead to an aesthetic and transcendental perception of an everyday situation: the *sharawadgi* effect. In the field of acoustic phenomena, *sharawadgi* characterizes a strange sound coming from an unknown or uncontrolled source that suddenly opens up a new acoustic horizon and enables an aesthetic experience amidst the undifferentiated mass of everyday noise (Jean-Francois Augoyard and Henry Torgue in *Sonic Experience*). When the ice on a frozen lake suddenly gives off strangely synthetic sounds and we no longer feel safe on its vibrating surface, we might call this a s*harawadgi* effect. Volcanic eruptions are a classic example of a hidden, mysterious source of sounds which, although we can explain them in scientific terms, fill us with terror and awe on account of their physical energy. The same is true of the mysterious ice sounds recorded by the Alfred Wegener Institute with its underwater microphones beneath the Antarctic ice shelf, the source of which has yet to be identified. All these sounds are strange "by nature" and have yet to enter our acoustic normality; as a result, they can only be given a metaphorical charge via a process of active listening and subsequent inclusion in the catalogue of commonly known sound objects. Hearing these sounds “blind”, then, may come close to a direct, physical experience that allows the energies unleashed by the heat and the cold to be felt, focussing more on processes than on the narrative potential of these sounds.

The formal structure mirrored in the two pieces is the vessel into which the inventory of hot and cold sounds was poured. The aim here was to find a balance between influencing the sounds in compositional and acoustic terms, and leaving them in their original context. Ultimately, both pieces involved a great deal of compositional work on the micro-level, most of which remains hidden to the listener as it was often a case of “recomposing” natural behaviour – assembling and compressing lengthy processes of freezing or heating up. The contrast between the loudest and the quietest sounds opens the twin pieces; the loudest event (volcanic eruption, iceberg collision), giving rise to sustained droning or “singing” tones, is juxtaposed with the quietest sound phenomenon (evaporation of water drops, falling snow). After this, various states of heat and cold are passed through, describing a slow decrease in energy – in the case of fire, a gradual smouldering and cooling, and in the case of ice, a gradual melting and thawing. Towards the end of both pieces, rhythmic textures are woven in, translating the self-organizing structures in flame patterns and frost formations into acoustic terms and referring to the contemplative qualities of observing fire and ice phenomena. Ultimately, the differences in sound between hot and cold remain hard to define: the quiet crackling of burning coal or wood is similar in many ways to the tinkling sound of melting glacial ice, and even the mighty noises of volcanoes and icebergs seem deeply related.

Information on the individual sound phenomena

- Volcanoes and geysers

The volcano recordings were made at Mt. Yasur in Vanuatu (one of the world’s most active publicly accessible volcanoes), at Vulcano Arenal in Costa Rica, and at Mount Etna in Sicily. The geyser sounds are from Iceland and were kindly made available by Hanna Hartman. In *fire pattern,* these natural sources were combined with man-made sounds, two of which are briefly described below.

- Singing flames

The phenomenon of singing flames was discovered in 1870 by Frédéric Kastner and used in his “pyrophone”. This “fire organ” consisted of glass tubes, in each of which a gas flame causes the air column to vibrate. Depending on the length and diameter of the tubes, each singing flame could be tuned to a note. Kastner’s invention was soon forgotten, as the town gas in use at the time soon proved too unsafe and toxic. Today, the singing flame principle is used by sound artists including Andreas Oldörp in sound installations. Different gases such as hydrogen, propane, butane and methane are used, which possess different light and sound properties and which can be adjusted to the requirements of each project. The recordings of singing flames used in *fire pattern* were made in Andreas Oldörp’s workshop. They were supplemented by recordings of the “chemo-acoustic” instruments of the performance artist

Bastiaan Maris who uses gas flames to play huge metal pipes.

- Ignition of burning alcohol in a bottle

This effect, known as the *whoosh bottle,* is often used in physics lessons to demonstrate processes of combustion. For *fire pattern,* several large glass flasks were rinsed out with pure alcohol and ignited at the opening. This creates a mounting sequence of puffs of varying lengths that resonate with the various frequencies of the bottle. The resulting sounds are reminiscent of those made by volcanic eruptions and geysers.

- Singing icebergs

On July 22, 2000, in the Antarctic a huge iceberg measuring 25 by 15 kilometres struck a rocky protrusion on the sea bed. Over the following 16 hours, the iceberg scraped over the sea bed, triggering a local earthquake. The seismic data were recorded and analyzed by the Alfred Wegener Institute's Neumeyer Research Station and by the company of Fielax. It was possible to transpose the infrasound signals into the audible range, resulting in sustained, screeching sounds with slightly varying tone. Water is probably forced through cracks and hollows within the ice at high pressure, causing the walls to oscillate. The researchers coined the term "singing icebergs" and published their findings in the journal *Science* (Vol. 310, p. 1299). Significantly, the sounds from the iceberg resemble the tremors recorded prior to the eruption of volcanoes. This has raised hopes of being able to gain new insights and facilitate predictions concerning volcanic tremors, as icebergs are far easier to study than volcanoes.

- Dispersion of sound waves in ice sheets

The sound recordings of frozen lakes were made in the winter of 2005/06 in the area around Berlin. Frozen lakes are known to give off most noise during major fluctuations in temperature: the ice expands or contracts, and the resulting tension in the ice causes cracks to appear. Due to the changes in temperature, the hours of morning and evening are usually the best times to hear these sounds. In my experience, thin ice is especially interesting for acoustic phenomena; it is more elastic and sounds are propagated better across the surface. Snowfall, on the other hand, has a muffling effect and the sound can only travel to a limited extent. The ice sheet acts as a huge membrane across which the cracking and popping sounds spread. Underwater microphones proved especially well-suited for these recordings: in a small hole drilled close beneath the surface of the water, the sounds emitted by the body of ice carry particularly well. The most striking thing about these recordings is the synthetic-sounding descending tones caused by the phenomenon of the dispersion of sound waves. The high frequencies of the popping and cracking noises are transmitted faster by the ice than the deeper frequencies, which reach the listener with a time lag as glissandi sinking to almost bottomless depths.

- Ice sizzle

Glacial ice consists of snow that has been extremely compressed and compacted. In the case of the inland ice in Greenland, this process may stretch over thousands or even millions of years before the ice is pushed into the sea by a glacier. As the layers of snow pile up, tiny bubbles of air are trapped and put under enormous pressure by the weight of the surrounding ice. When the glacial ice finally melts in the sea, these tiny bubbles of air are released with a quiet, explosive popping noise, adding up to a many-voiced sizzling. The icebergs that drift in the Arctic give off a constant sizzling sound which is loud enough to determine their position from under water. The phenomenon was first noted by the crews of submarines. It is also known as “bergy seltzer” due to its resemblance to the sound of fizzy drinks.

- Snow on aluminium foil

It is extremely difficult, nearly impossible, to get a decent recording of falling snow because the signals would always be too quiet. This problem can be solved by using aluminium foil stretched on a frame and a contact microphone. The foil acts as a microphone membrane onto which the snowflakes fall directly, allowing them to be recorded. There are many different kinds of snow – the wetter and heavier the snow, the heavier it falls, the harder the sound, eventually sounding more like rain. The most interesting sounds are made by light and fluffy snowflakes in which snow crystals cluster together. These snowflakes thaw on impact and give off fine crackling sounds.

- Creaking and cracking ice

Members of 19th-century expeditions to the North Pole who were trapped in the pack ice and forced to spend the winter there told of the creaking, screeching and booming sounds that came from the constantly shifting ice, to the profound consternation of the sailors (an excellent account can be found in “The Terrors of Ice and Darkness” by Christoph Ransmayr). When two mighty ice floes are pushed into or over one another, the friction between the edges can produce very loud squeaking noises, distantly resembling those of scraping metal and the like. But this phenomenon can also be experienced in a less spectacular context, for example by pressing lightly on the thin covering of ice on a freshly frozen pond or puddle. This will usually produce a fine squeaking sound and the ice will crack under the pressure being exerted on its surface.

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