

TRANSLATED FROM GERMAN

Radio Interview

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## How does the "white skin" sound?

Benjamin Koren in conversation with Carsten Beyer



*The construction of the great hall. A special wall cladding system, the so-called "white skin" will provide for good acoustics*

**Benjamin Koren** invested eight years of his life into the Elbphilharmonie – specifically in its sound. He is the inventor of the white walls of the concert hall, which distributes sound evenly throughout the room. It would have been impossible to solve this task without the use of a computer.

**Carsten Beyer:** No other German concert hall has been the subject of debates as much as the Hamburg Elbphilharmonie – these debates often involved unpleasant topics such as construction delays and out of control construction costs. But the big moment has finally arrived – tomorrow evening is the opening concert. Tickets to the event have been sold out for months. 2000 lucky ticket holders are eager to finally listen to the orchestra led by conductor Thomas Hengelbrock. However, everybody will pay special attention to how the Elbphilharmonie sounds as the actual acoustics of new concert halls are only revealed during real-life performances.

I've discussed this with a man who has been deeply involved with the Elbphilharmonie, the computer specialist and architect Benjamin Koren. He developed the models after which the complex skin of the Elphilharmonie was constructed. Firstly, I asked him if he was at all sad that he will not be able to attend the opening concert in person?



*Benjamin Samuel Koren is an architect, musician and computer scientist. He calculated the surface pattern of 10,000 panels on the computer*

**Benjamin Koren:** Of course I feel a little bad. I will however watch the live stream of the opening concert via the internet from New York. Besides, the opening of the Elbphilharmonie is quite an emotional event for me personally, considering that I've worked on this project diligently for the past eight years, ever since the founding of my company "One to One" in Frankfurt, Germany. That is quite a long time when you put it in perspective: it is the same amount of time Obama was president or the amount of time the Beatles were together.

**Beyer:** You are a pianist who studied music as well as architecture in the USA and England. How did you end up working on this enormous Elbphilharmonie project?

**Koren:** I think that it was somewhat of a lucky coincidence. When I studied architecture at the Architectural Association in London, I worked on a music pavilion that involved acoustics, music, mathematics and architecture. It just so happened that a partner of Herzog & de Meuron, who was present at the school for my master thesis, liked my work. One thing led to another and he spontaneously offered me a job which I gladly accepted.

**Beyer:** Just to clarify, Herzog & de Meuron is the Elbphilharmonie's architectural firm. That is quite a big responsibility, this concert hall, had you ever worked on something similar in the past?

**Koren:** No, not a project of this size, however we did create scaled acoustic models of this project for the acoustician Yasuhisa Toyota, including this particular model of the Elbphilharmonie, which many probably know as it has been on display at the Magellan-Terrace in Hamburg for many years. The work on the models was quite interesting as it revealed from the beginning the degree of complexity we had to deal with. The model of the Elbphilharmonie was highly detailed and very precisely constructed. It served as a "test-run" which allowed us to learn quite a bit. Once the model was constructed, we merely had to "scale it tenfold".

**Beyer:** Mr Koren, the acoustics of a new concert hall is always an exciting undertaking. What exactly needs to be planned so that nothing gets suppressed or sounds "muddy" and the sound is just as brilliant in the back of the hall as in the front row?

**Koren:** There are certainly many acoustic factors that play a role, however it was exactly the goal of the sound-diffusing surface of the "white skin" to scatter the sound waves as evenly as possible.

**Beyer:** The Elbphilharmonie is truly a unique building. The large concert hall is very tall and very angled. The stage is centered with the audience sitting in nested platforms, or "terraces". Is it even possible to achieve optimal sound in such a complex room?

**Koren:** The factors contributing to optimal acoustics in a concert hall is an important and well-discussed subject in our industry. There is general consensus that there are no optimal conditions as every concert hall sounds different and possesses unique qualities that make it unique. For example, the Berlin Philharmonie, as planned by Hans Scharoun in the 1960s, had many critics questioning the unique orientation of the elements in the room, where the stage was located in the center. As we all know by now, that concert hall has become one of the most beloved in the world.

**Beyer:** Absolutely.

**Koren:** Not only the acoustics, but many other architectural factors play an important role such as the seats, the ambiance, the light, the haptic quality of the surfaces etc. In that regard, everybody involved with the Elbphilharmonie, from the architects to the builders, went to great length to ensure that this concert hall will be one of a kind and exceed all expectations.

**Beyer:** From your lips to God's ears. Maybe you can explain, as it relates to your work, the process for creating the skin of the Elbphilharmonie? How should we imagine it?



*Elbphilharmonie: The so-called "White Skin" consists of 10,000 panels created on the computer*

**Koren:** You could say that my work was entirely abstract in nature, digitally as well as mathematically. The acoustician Yasuhisa Toyota envisioned the entire skin of the interior of the concert hall to be made of fist-size cones. Their purpose was to scatter the sound waves as evenly as possible throughout the space. The architects felt that the pattern should resemble the overall design of the Elbphilharmonie to achieve complete harmony. The peak-and-valley design, most prominently displayed on the roof of the Elbphilharmonie was to be repeated throughout the "White Skin". I personally found this approach very appealing as it had a direct relation to music.

In classical music, such as in Beethoven's Symphonies or Sonata works, composers also take a simple theme which they vary and repeat. I took the same approach when it came to programming. I overlaid the entire concert hall with a virtual grid, similar to the repeating bar lines on a piece of sheet music. In the computer, the pattern was initially applied in an orthogonal grid and afterwards altered algorithmically. The result is a smoothly animated surface, which does not repeat itself at any point.

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**ONLINE LINK (Original German Article)**

[http://www.deutschlandradiokultur.de/konzertsaal-der-elbphilharmonie-wie-klings-die-wei-sse-haut.2177.de.html?dram:article\\_id=376009](http://www.deutschlandradiokultur.de/konzertsaal-der-elbphilharmonie-wie-klings-die-wei-sse-haut.2177.de.html?dram:article_id=376009)