STONE OF MUSIC

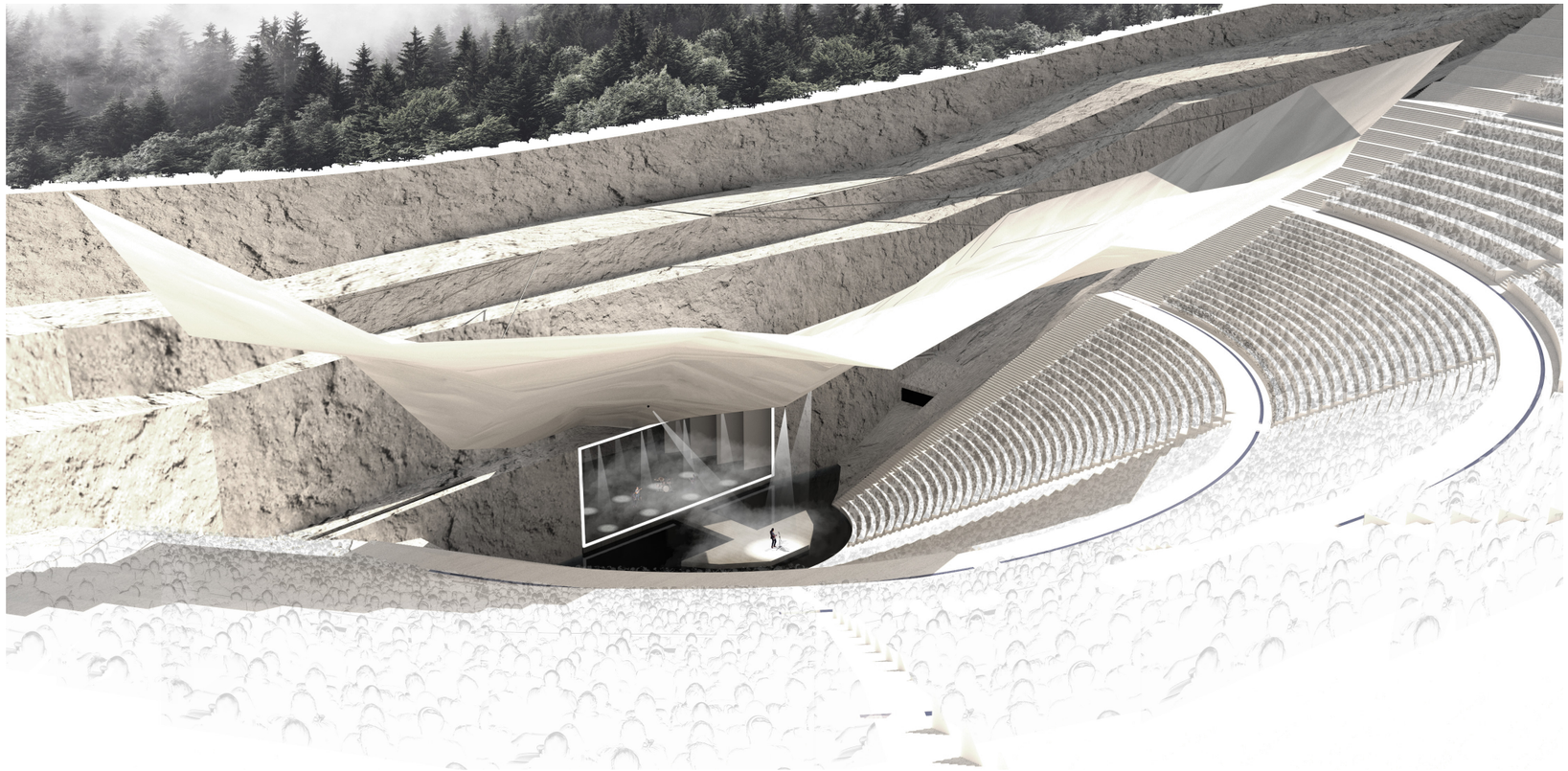
A SYMPHONIC QAURRY

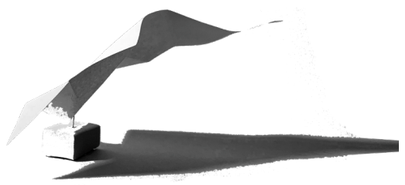
BATCHELOUR THESIS IN ARCHITECTURAL AND ENGINEERING. ACEX15

ADOBE, AUTOCAD, CATT-ACOUSTIS, GRASSHOPPER, RHINOCREOUS

MORTEN LUND . SPRING 2020

JOSEFIN KRÜGER





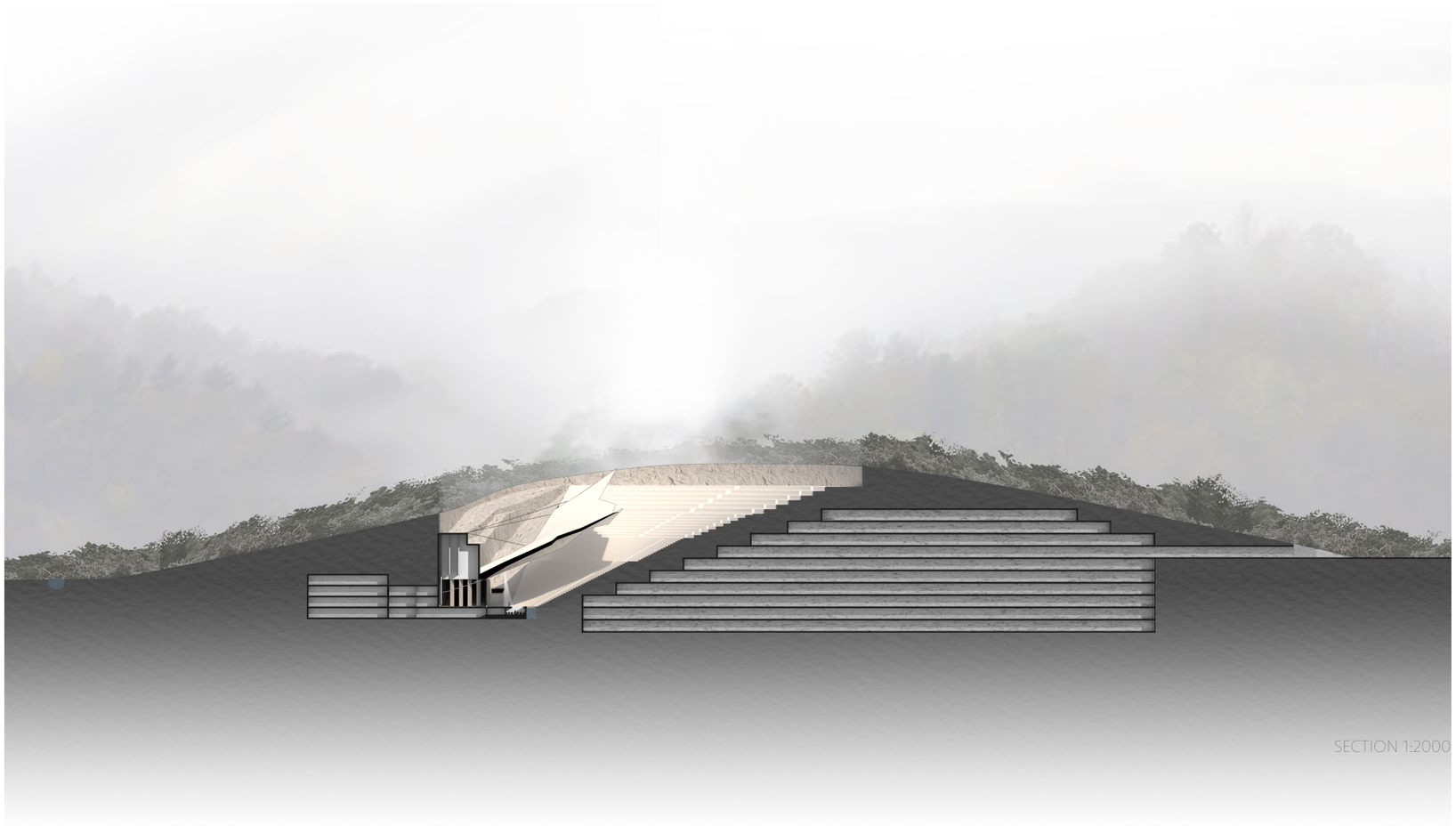
THE PROJECT

The pine and oak forest covering the state of Alabama opens upon a hill near a river to reveal a stone quarry from within musical and theatrical acts of all kinds are performed. From down deep in the quarry, surrounded by water, music flows along the surface of a wing, creating a spectacular atmosphere.

A project by Anna Stigenberg, Josefin Krüger and Leon Müller.

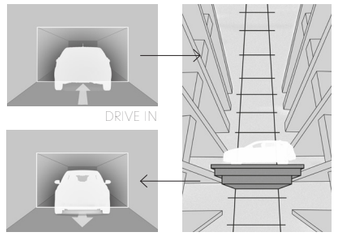
THE SECTION

An extensive garage, with a capacity allowing all visitors to travel by car, creates a hill from where a stone quarry is carved out. At the bottom of the quarry, a stage is placed in a pool of water and is surrounded by sloped stone shaped into audience seating. The forest and topology blockade disturbing sounds from surrounding roads, creating a secluded atmosphere in the arena.



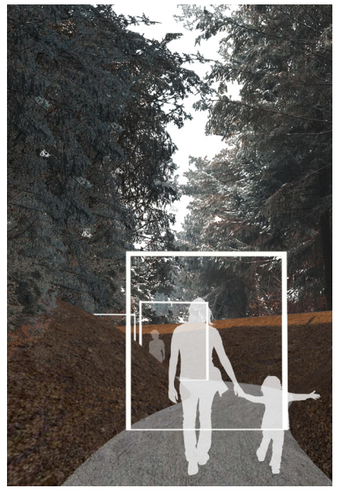
SECTION 1:2000

THE VISITOR'S WAY



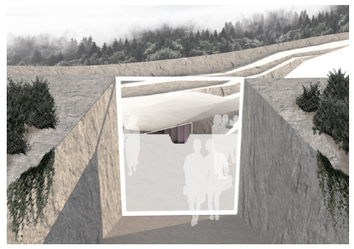
THE PARKING

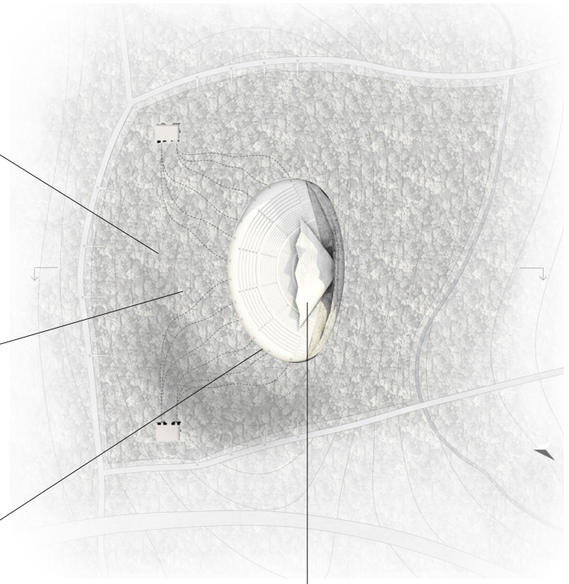
Arriving at the site, visitors with cars enter the parking garage entrances accentuated by white illuminating rectangles. The visitor leaves their vehicle directly inside and travels upwards while their vehicle is parked automatically in an area connected to an exit near the visitor's seat. This allows for an efficient arrival and departure.

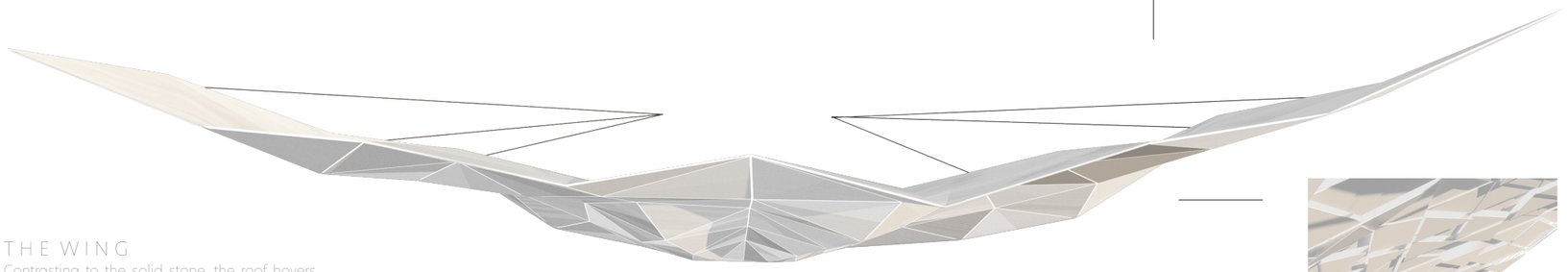

FOREST PATHWAY

THE RITUAL

The visitor exits the garage into an open lawn enclosed by forest. Via ticket counters, the visitor is led by the recurring and repetitive white illuminating rectangle through the forest on a quiet pathway. This ritual, a quiet moment, creates a thrilling difference contrasting to the vibrant concert. At the end of the pathway, the visitor is welcomed trough the last illuminating rectangle directly into the quarry. The quiet sound image is replaced by the imposing sound within the quarry.


ENTRANCE SITUATION

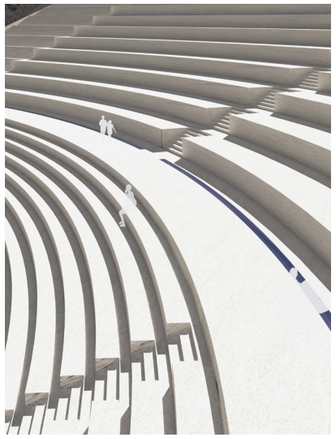

SITUATION PLAN 1:2000



THE WING

Contrasting to the solid stone, the roof hovers light above the arena. Attached to the proscenium, the white roof of folded triangular panels opens up above like a bird's wing. The diffusive and reflective panels can be lowered independently, revealing an absorbent surface underneath, enabling an adjustable sound image over the arena.

Roof detail: Panels



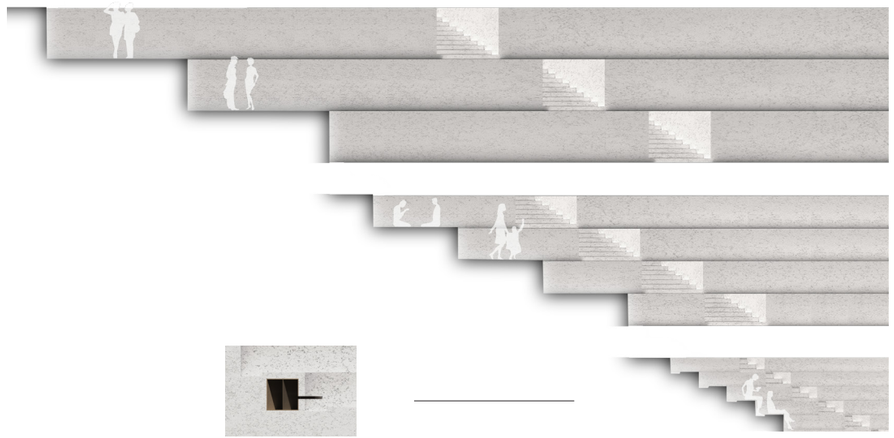
PERSPECTIVE SEATING

THE STEPS

Inspired by the ancient Greeks, the sloped stone within the quarry is shaped into an amphi-theater shape, allowing an even sound image and view across all seats. Sections are separated via stairs and long water ribbons.

The seating changes up via the steps. Starting with the most formal seating closest to the stage that further on transcends in deeper and deeper steps, allowing picnic arrangements and at the top free movements.

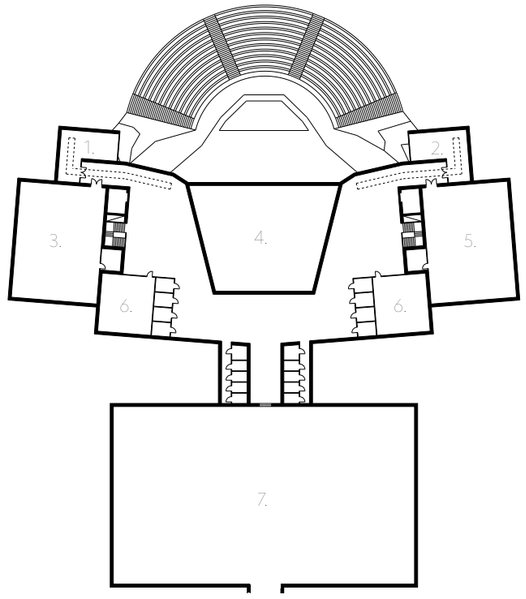
Helmholtz resonators are hidden within the steps in the hollow hill. Unconnected to each other, the back wall of the resonator opening can move, enabling an ability to control the sound image.



SEATING DEATAIL:
HELMHOLTZ RESONATOR

SEATING SECTION 1:200

THE PLANS



FLOOR 1 1:2000

BACKSTAGE

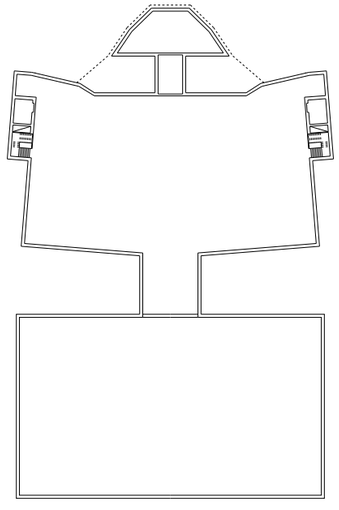
Facilities situated behind the stage creates a blockage to disturbing sound from the river. Here, performers and staff facilities are distributed on three floors.

Two rehearsal rooms are located on the second floor with a distance between each other and to the stage as well as surrounded by rock, therefore protected from sound disturbance.

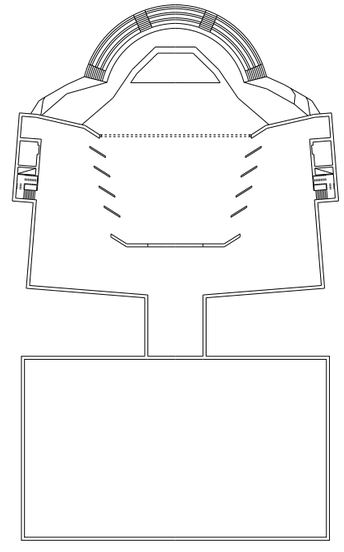
Floor -1: Mechanical room, orchestra pit entry

Floor 0: Stage floor, storage, garage entry

Floor 1:
1. Green room
2. Offices
3. Rehersal room orchestra
4. Stage house
5. Reahearsal room movement
6.Dressing rooms
7. Parking

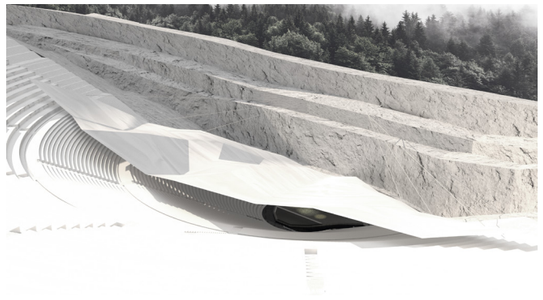


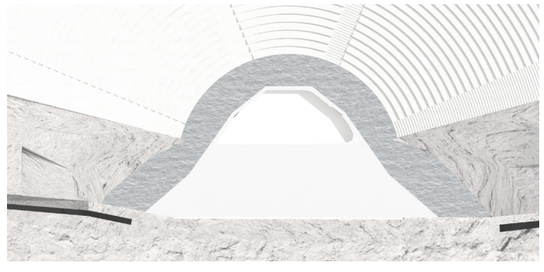
FLOOR -1 1:2000



FLOOR 0 1:2000

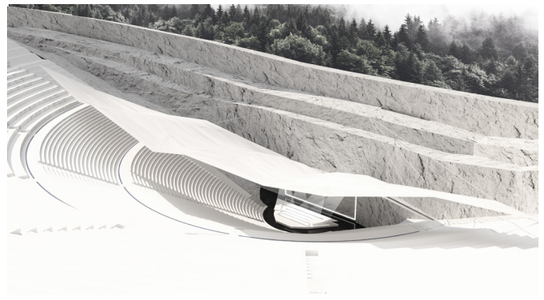
THE MUSIC SCENARIOS

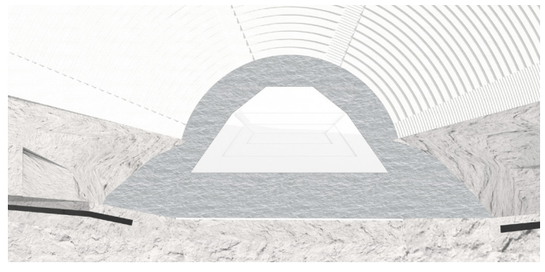




SPOKEN WORD

During acts with spoken words, such as theater, with an audience of 5 000 people, the roof folds and encloses the audience. This creates a strong first reflection and ensures a good reverberation. The stage is in its complete form.

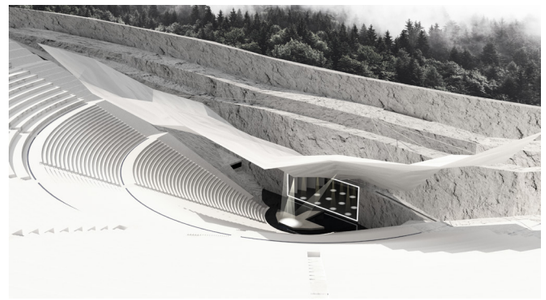


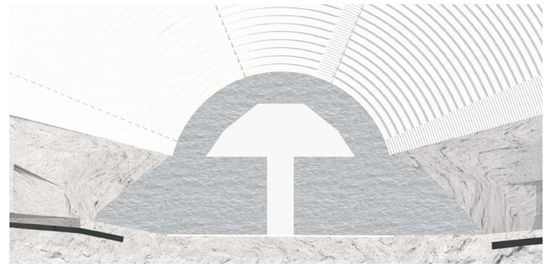


SYMPHONY

During acts with symphonic music, the roof folds and closes halfway. This creates an even sound image and views for an audience up to 10 000 people, sitting under and outside the roof.

Speakers distributed within the roof enables amplification of the natural sound. In acts with orchestra only, the stage transforms for sedentary and an island is created, exposing more of the water pool.

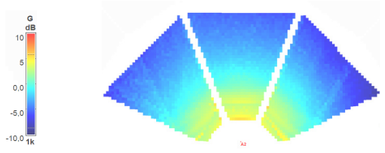




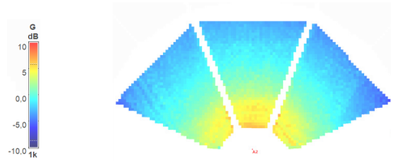
ROCK AND ROLL

During larger performances such as pop and rock n' roll, the roof is kept in its original, opened form.

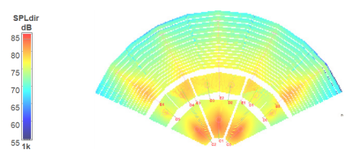
Speakers hidden in the roof amplifies the music and additional speakers are possible to mount further back in the arena. These acts allow an audience of up to 25 000 people. The stage transforms into a catwalk combined with a small island closes to the audience.



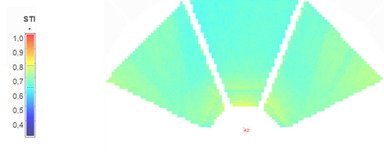
SOUND STRENGTH
5 000 audience
Closed roof



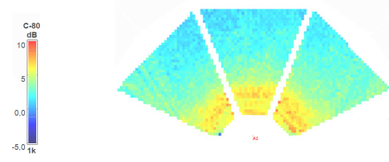
SOUND STRENGTH
5 000 audience
Half closed roof



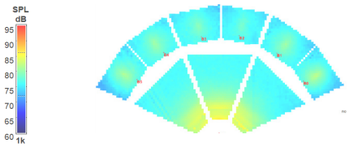
SOUND PRESSURE LEVEL
elecro acustic reinforcment
25 000 audience



SPEACH TRANSMISSION INDEX
5 000 audience
Closed roof



CLARITY, C_{80}
5 000 audience
Half closed roof



SOUND PRESSURE LEVEL
elecro acustic reinforcment
10 000 audience

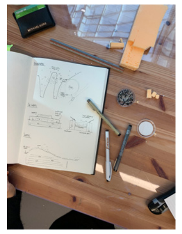
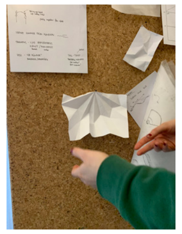
THE DESIGN PROCESS

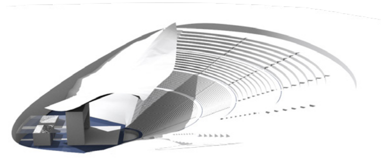
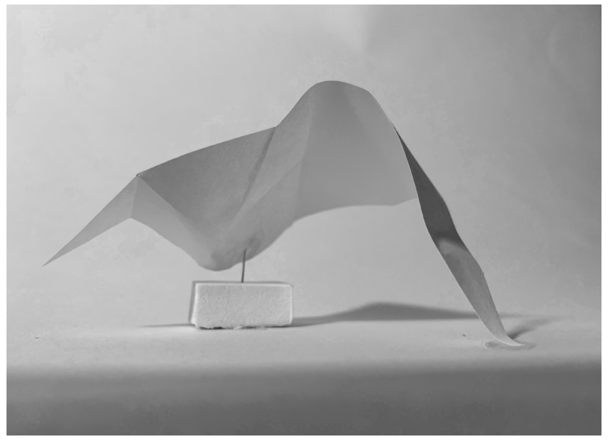
We worked a lot with physical models in the beginning, experimenting and getting to know to place better in a simple way. It's so much easier to see the altered qualities but also the difficulties on the place when you work with your hands. You also get a better image of how it looks and changes with different alternatives. Besides we did a lot of sketching by hand to pitch our ideas to each other.

The stairs were the first critical decision we made because that was the basis and staring point to our project. We walked in as many stairs we found in and our Chalmers to find out what we liked and what was suited to get the result we wanted to have: a stair combined with seating, picknick seating and festival standing. It was a bit tricky and we tried our best to come up with a new variant to get the ultimate seating as well and finally we did. I think we solved the problem with having a comfortable seating great by making a clear division between seating and the next feet. During the project the stairs didn't change so that was kind of a safe point even though we doubted sometimes.

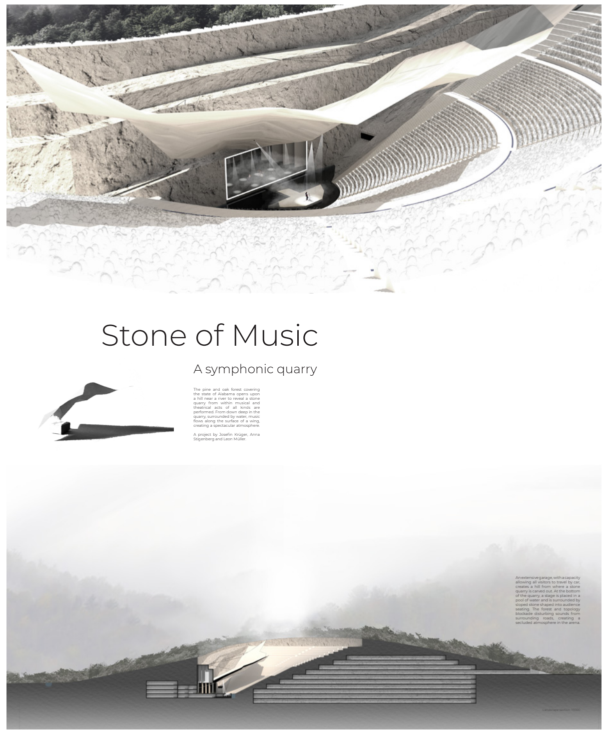


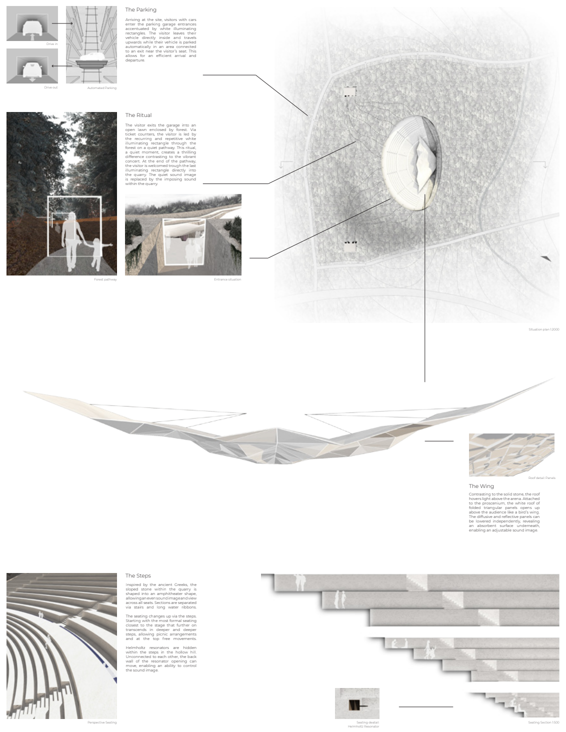
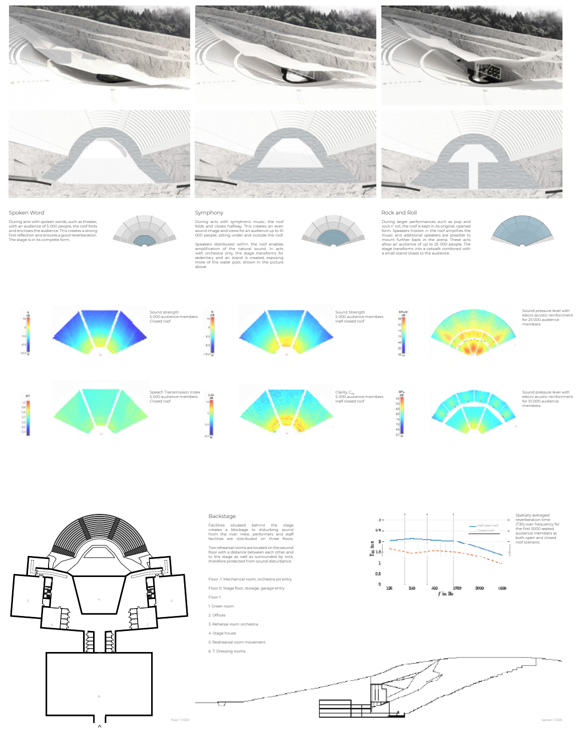


THE PRESENTATION BOARDS



THE REFECTION

THE COLLABORATIONS EXPERIENCE

This project has been amazing! I really loved working together with Anna because she's so talented and it felt like we had a really good communication. We did our best, help each other out with tips and talked a lot every day during the project. Our communication was the most important part I think but also that we are quite similar in taste but different in skills, so we could always solve our problems together.

THE METHODOLOGY

We started with the first assignment design pavilions in three different places in Gothenburg. The places' challenges and specialties formed the pavilion together with what qualities we wanted to achieve. This was a good start to get an insight in how the topology affects the design and how you can work with it.

Then it was time to start with the real site plan. Already when we got the project, we knew that we wanted to work with natural elements combining and contrasting each other. Like a big heavy stone quarry contrasting with a light floating roof and smooth water or the loud, lively concert contrasting to the quiet, soft forest. Our biggest inspiration was Dalhalla in Gävle, Sweden combined with the old ancient amphitheaters.

One of the first thing we decided was that we wanted to create a rolling landscape so then it was natural to make an underground parking garage created the hill we wanted to have behind the quarry. We worked closed during the hole project, discussing every decision together so the result become as good as it could.

THE ARCHITECTURAL AND ACOUSTICAL QUALITIES ACHIEVED

I'm very proud over what we achieved. Our project is really work through and I think it's easy to follow for a first reader from how you enter the place to what feeling you get in the different spaces. The architectural qualities are connected to the acoustical because I think you get the best experience in a combination of them both. Our roof is the biggest quality in our project just because it has both the design and the ability to spread sound to get a good acoustic in the hole place. The roof is also the first thing the visitor sees entering the arena, in contrast to the heavy stone which make a grand entrance.

The acoustic part has been very exciting and iäve learned a lot so now I'm able to see the link between the design and the different parameters and how that changes. So interesting how materials, angel and size can have such an impact on acoustics. I've learned a lot that I will bring into projects in the future.

SOME DRAWINGS