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Explore Lab Graduation Studio / 39
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Argumentation of Choice of the Studio

My decision to choose the Explore Lab as my Graduation Studio originated in my independent bachelor thesis at the TU Berlin. The open studio format encouraged me to define my own perspective on architecture, which has shaped my academic career significantly. The Explore Lab Studio not only challenges me to refine my individual approach to architecture, but offers the academic guidance to develop my personal fascination in a scientific context. As I approach the end of my master program, I am convinced that the experience of graduating at Explore Lab will help to kickstart my professional career as a freelance architect.

Above and Below
Exploring the interplay of nature and architecture in Favignana´s quarries over time

Location / Fascination

Favignana, the biggest of the Egadi Islands, is located 8km off the coast of western Sicily. Sometimes referred to as “Quarry Island”, the practice of extracting, building and selling lime stone has been a vital part of the islands economy since the romans. More than 2000 years later, the now abandoned quarries cover approximately 20% of the islands surface[1].
This spacial condition has resulted in an unique extraction landscape, which defies categorisation of natural and anthropogenic. Upon closer inspection, the local architecture has seemed to develop an interesting duality. The constructed dry walls and stone houses above the surface are an expression of the countless excavated caves and pits below[2]. And even long before the first traditional buildings appeared in the middle ages, abandoned quarries have been used as dwelling, gardens, tombs and prisons[3]. Whether carved into or constructed with limestone, the quarry architecture of Favignana defies categorisation of purpose and intend. If compared to the extraction landscapes of industrial marble quarries in Western Sicily, the differences to more conventional extraction practices become apparent. Within decades, the natural ecosystem is completely erased by the endeavour to extract the maximum amount of material possible, before voids are often used as landfills[4]. Disturbingly, Sicily’s marble industry only seems like a drop in the ocean compared to the destructive aftermath of extracting natural resources like coal, iron or oil[5]. After all, the extraction landscapes of today are the ecosystems of tomorrow.

Problem Statement

Temporality
The Architecture of a Quarry highlights the interdependency of the human and geological timescale. While the islands oldest quarries date back centuries, Favignana´s extraction practice is only possible because of the formation of calcarenite sediments millions of years ago[6]. The Anthropocene marks a turning point, as the consequences of human activity suddenly shape our natural environment[7]. How can architects make better decisions today, to extend the lifespan of our buildings into post-anthropogenic future?

Technicity
Architecture is considered a cultural process of extraction, excavation and construction. Although, any building which is concerned about its lifespan in the future can’t be isolated from the entropic condition of decay. How can we include natural processes of sedimentation and erosion in our subtractive and additive toolset as architects?

[1,3]AMBROGGI, “Cava 73. Abitare in negativo. Valorizzare il vuoto.”
[2]Marsala and Mei, “Inland Areas between Description and Transformation. The Case of the Disused Quarries on the Island of Favignana.”
[4]Berger, Designing the Reclaimed Landscape.
[5]Calenzani, The Architect’s Handbook of Marble, Granite, and Stone Vol. 2, Overvieuw of the Italian Stone Industry
[6]Kil, “Sedimentology and 3D Architecture of a Bioclastic Calcarenite Complex on Favignana, Southern Italy: Implications for Reservoir Modelling.”
[7]Turpin, Architecture in the Anthropocene.

"The Earth is an Island"
By studying the overlay of extraction landscapes and urbanised areas on the Island of Favignana we can draw conclusions about a more universal problem of the earth. While we are still able to separate landscape and architecture today, our continuous anthropogenic expansion makes post-industrial landscapes the habitats of the post anthropocene[8]. How can the case study of Favignana´s quarries inform a resistance to extractivist thinking in architecture?

Research Phase

Research Question
My main research question is divided into two consecutive sub questions. For the purpose of my Graduation Report I will sum up my preliminary outcomes below.

How do natural and cultural processes shape Favignana´s quarries over time?
a) How were Favignana´s quarries shaped in the past?
b) How are Favignana´s quarries shaped today?

Scale does(n't) matter
Natural and cultural processes shape Favignana's quarries on all scales simultaneously. The geological processes of erosion and deposition taking place on the macro scale of the earth influence the cultural processes of extraction and construction taking place on the meso scale of the island. Finally, the spacial condition of each quarry reflects the interrelation of natural and cultural processes on the micro scale.

The Quarry as an Architecture
Just like the construction process of a building, the spacial configuration of a quarry follows a strict set of rules which can be retraced. Archetypes of the cave quarry are entrances providing accessibility from the sea, pillars and vaults to support the ceiling and chimneys to provide fresh air, light and access from above. Archetypes of the open pit quarry are ladders and stairs to provide access from above, towers of untouched stone due to poor quality and gates which connect different quarries to a maze like structure.

The Quarry as an Ecosystem
Once abandoned, the process of ecological succession sets in which can be retraced by analysing the vegetation in relation to the habitat. The ecosystem of a quarry is defined by the interplay of natural conditions like climate, precipitation and wind with the individual orientation, location and layout of each quarry. While the industrial quarry only represents pioneer species like pines and lychen taking root on the rocky soil, the premodern quarry contains the necessary microclimate for high gras and shrubs. If interfered with by anthropic measures of bringing in soil, adjusting the quarries layout and bringing in non-native species, the quarry can reach the bio diversity of a botanical garden.

The Quarry as a Sculpture
The entropic decay reflects in the scale of the stone and is driven by natural processes of sedimentation and erosion. Previously extracted as a building material, ashlars were usually cut in the standardised dimension of 25cm x 25cm x 50cm.

[8]Ellis et al., "Anthropogenic Transformation of the Biomes, 1700 to 2000."

Depending on the layers and properties of the calcarenite, each stone erodes over time and transforms into an organic shape of sculptural quality. The transformation process can be retraced by analysing the surface area in relation to the volume.

Research and Design / Transition

The transition to the design phases is guided by overlaying the parameters of location, temporality and technicity. The diagram “research-design transition” visualises how the research informs the design phase. The outline of my design project is defined by a set of design principles.

Above and Below
The interplay of…
a) natural processes of erosion and sedimentation on the scale of geological time
b) cultural processes of excavation and construction on the scale of anthropological time
… results in the Duality of the Architecture above and below. Over time, Favignana´s quarries have transformed into resilient ecosystems of sculptural beauty by renaturizaion and entropic decay. How can post anthropogenic architecture embrace processes of decay, transformation, and time, rather than resist them?

Buffer Zone
Today, Favignana´s cultural legacy of quarrying Calcarenite has been widely abandoned. Instead, a seasonal tourism industry exploits the islands water resources and threatens the island social and economic balance. Accelerated by the influence of climate change, the island now faces the challenge of pressing water scarcity and extreme weather conditions. How can Favignana´s quarries act as a spatial resource to buffer the consequences of recent developments?

Field Laboratory
As a first step towards the design phase, I revisited my research by focusing on the embodied experience of Favignana´s quarries. With the help of intuitive collages and physical models, I explored visual and haptic atmospheres of the architecture above and below. While the excavated spaces offer thresholds of light and shadow, warm and cold, or wet and dry, construction materials like wood, steel and stone decay under the influence of salt.

These design principles lead to the following design question:
How can we reimagine Favignana´s architecture by timing the interplay of natural and cultural processes?

Design Phase

My design project consists of two complementary phases which together pick up on the Duality of Architecture as found on Favignana. The Immediate Activation and the Entropic Construction are two consecutive design strategies which can be applied in any quarry on the island. For the purpose of my design, I have chosen a specific quarry as a site to showcase the implementation of the design strategies in a real life scenario. The chosen site on the north coast of the island incorporates a variety of architectural qualities, ecosystems and sculptural elements which I investigated in my research. A detailed 3D Scan of the site helps to simulate the implementation of the design strategies as realistically as possible.

1) Immediate Activation
My first design strategy is aimed to reactivate Favignana´s excavated by developing a temporary scaffolding structure. The design objective is guided by the question: What is the minimal architecture intervention to reintroduce human actors without disturbing the current ecology of the site?

a) Fragmenting
First, the quarry is segmented into spatial fragments, each of which is analysed in relation to their individual features. What is the characteristic athmosphere within the space? What are traces left by human and non-human actors in the past? And finally, what does the space want to become f.e. a construction site, a natural reserve or a sanctuary?

b) Sequencing
Secondly, the fragments are aligned in spatial sequences, which allow a dynamic, embodied experience of the static fragments. How does the perception of a space change as you walk through them intuitively? What are the entrances/exits, pathways, intersections and milestones which allow for orientation and a sense of direction within the quarry?

c) Prototyping
Finally, a structural vocabulary provides accessibility, safety and functionality for an embodied experience of the quarry. Where do walkthroughs require attention to protect or guide either human or non-human actors? How can a series of modular pathways, handrails, stairs, pillars and meshes be deployed in any spatial condition of a quarry?

2) Entropic Construction
The starting point for my second design strategy is deposited material like sand, stone and salt water, which are collected and removed from the quarry during the immediate activation. The entropic construction, embracing decay, is guided by the question: How can we reimagine Favignana´s quarries as a post-extractivist construction process using locally available materials?

a) Framework
The synergy of the complimentary materials of salt and concrete is a key element for my process-driven design project. For centuries, sea salt has been traditionally farmed in western Sicily by evaporating sea water in shallow ponds during summer months. Nowadays, salt intrudes and salienates the groundwater reserves of Favignana. In order to produce fresh water, desalination plants will produce huge amounts of industrial salt waste in the future. Although, until recently, salt has rarely been used as a construction material due to its temporal nature, there have been numerous applications as lost formwork in the past. Drawing from David L. Chandler's (2023) findings on roman seawater concrete production, a parallel can be drawn in creating a formwork out of salt. In contrast to conventional cement, roman concrete has self-healing properties, making it more durable over time when exposed to salt. Chandler argues that this self healing property can be traced back to contents of lime and volcanic ash, which are abundantly present in the region of Sicily. (Chandler, 2023) Because this process hasn't been fully understood so far, Favignana offers the perfect testing ground to experiment with new ways of monolithic construction using salt and locally sourced concrete. Prior to initiating the building process, the focus should be on setting up a production line for salt and roman concrete on site.

b) Process
The building process follows four interrelated phases: production, formwork, construction, and erosion.

The production line includes a saltwater pool, referencing traditional wells used for farming on Favignana. Saltwater, sourced from groundwater in summer or directly from the sea, gradually saturates into brine. As the brine crystallizes, salt is harvested for reuse in the formwork. Material extracted from the quarry, f.e. lime, sand, and stone, is stored for the production of concrete. An oven built from massive limestone, a traditional feature known for its thermal retention, is used to burn lime at low temperatures for long periods of time. The resulting quicklime is then mixed with sand, stone and saltwater to produce concrete on site.

Formwork construction follows vernacular techniques, using wooden panels aligned to the building's perimeter. The outside dimensions of approximately 3.5m x 5m respect the typical spans of local architecture. Steel reinforcement bars are embedded vertically and horizontally to stabilise walls and ceilings. A drainage system is integrated into the foundation, enabling the controlled removal of saltwater during later erosion phases.

Construction proceeds in cycles, relying on seasonal heat. A foundational concrete layer is poured first. Subsequent layers of salt mixed with biological starch are applied, each approximately 50cm high. Hollow plastic buckets are embedded to reduce salt consumption and create voids. The salt-starch mixture hardens under the sun, after which it is sculpted to match the design. Concrete is then poured around the salt block, layer by layer, protected from premature erosion by a temporary roof. Openings for windows and doors are reinforced with steel meshes. This iterative process continues until the monolith is complete.

Erosion begins with the removal of the temporary roof and the wooden formwork. Seasonal rains and winter storms gradually dissolve the salt from outside, while collected rainwater within the hollow infills accelerates erosion from inside. Dissolved saltwater drains through the foundation and can be reused. What remains is a monolithic structure of Roman concrete, whose strength increases over time through salt exposure. The salt crystallisation of exposed steel elements provides a natural shading system to the building.

The spatial use of the monolith begins as erosion gradually reveals inhabitable voids. Doors, windows, and temporary ceilings are installed to complete the outer shell. Floors, ceilings, and furniture are added to match the monolithic interior. Over time, as human use diminishes, the temporary interventions decay, allowing the structure to reintegrate with the landscape and offer habitat for non-human actors. This cyclical transformation reflects a continuous dialogue between architecture, material processes, and ecological succession.

c) Pilot project
The proposed design aims to establish a house at the entrance of the Favignana quarry, positioned adjacent to an existing abandoned ruin. The perimeter of this ruin will define the outer boundaries of the new structure. Given that the quarry operates under restricted visiting hours, the building will serve as a functional entrance, housing a ticket office for visitors and a viewing terrace offering expansive views of the quarry. Below the terrace, a kitchen and living room will be integrated into the design, with some furniture elements, such as a kitchen island or table, being incorporated as monolithic structures. The kitchen will feature a traditional oven with a ventilation shaft that draws in fresh air, providing passive cooling during hot

summer months. Adjacent to the living area, a bath and a sleeping room will be housed within a separate monolith, with the bath featuring a walk-in tub carved from the same structure. The sleeping room will offer views of the island and the open ocean.

The typology of the house draws from local architectural traditions, particularly the continuous evolution of building forms around the quarry. The design utilizes monolithic volumes, typically ranging from 3 to 5 meters, which reflect the ceiling spans within the quarry caves. The walls are constructed with substantial thicknesses, over 50 cm, to ensure structural stability, with thicker walls considered for multi-story additions. The design emphasizes the spatial relationship between human and non-human actors, incorporating the quarry's traditional measurements and layout. The voids within the structure are sculpted to mirror the natural cave-like qualities, thus reinforcing the duality between mass and void in architecture. This interplay between form and function exemplifies the architectural dialogue between the built environment and its natural context.

Process / Methods of research and design

The two interrelated entities of research and design develop codependently throughout my graduation. My research and design strategy until P5 is divided into five consecutive phases, which I will briefly describe.

Mapping / until P1
By studying historical, theoretical and practical references, I want to develop an understanding of Favignana´s extraction landscapes, construct a theoretical framework and position my research within the architecture discourse. Secondly, I plan to visualize the relevant historical information within a geological and anthropological map. As an outsider of Favignana´s local context, I aim to maintain an objective position and evaluate my scientific sources in relation to their individual perspective.

Fieldwork / until P2
During my fieldwork, I immerse into Favignana´s extraction landscape by actively embracing the subjectivity of my human senses. Equipped with a camera, a LIDAR scanner, a microphone and a backpack, I conduct interviews, scan the architecture of a quarry and collect material samples. The tool “photogrammetry” helps me to digitalise pictures into georeferenced 3D surfaces which I then analyse, seriate and transform using the parameters of temporality, technicity and location. Informed by the previously collected information, I eventually reassemble the digital traces into an interpretive construction process of Favignana ´s quarry architecture.

Field Laboratory / until P3
As a first step towards the design project, I translate digital 3D Scans back into the physical realm with the help of 3D Printing. By iterating between analog and digital, I can utilise the model as a design tool for my architecture. Until P3 I plan to conduct material tests with sand, concrete and salt water to explore how to use sedimentation and erosion in the construction process of a building. The experiments on the material level are accompanied by a study of visual athmospheres. By utilising intuitive collages I investigate my embodied experience of Favignana’s quarries and explore contrasting athmospheres of light and shadow, warm and cold, and wet and dry.

Design Strategies/ until P4
This phase will be guided by the question of how I can develop site specific design strategies for the context of Favignana´s quarries. By revisiting the Island, I hope to collect more site specific information for my design project. The collected data will help me to simulate a real life scenario for the purpose of a carefully integrated design strategy for my P4.

Implementation / until P5
After developing my design strategy, I want to focus on making the outcomes of my graduation project accessible for a wider audience. A research booklet makes my work available for the local community of Favignana, as well as informing research on similar case studies in the EU. The 3D Scans inform architecture plans which are visualised on posters. My design project becomes a multi-sensory experience through the scale of the object. A range of physical models showcases the spatial quality of my construction process using salt and concrete. The implementation of my structural vocabulary is represented by detail fragments in a scale of 1:20.

Literature and general practical references

My graduation project is situated within the discourse of Time in Architecture. While according to Martin Trachtenberg, Modernism tried to eliminate time out of the equation of contemporary architecture entirely[9], Etienne Turpine´s “Deep Time Material Event” describes architecture as a fluid state of temporarily assembled material from the perspective of geological time[10]. Favignana´s quarry architecture, first described by Teresa la Rocca in 1995, manages to bridge the gap between the human and geological timescale[11]. Throughout the last decade, the case study of Favignana has repeatedly been studied from the perspective of architecture. Examples for academic research are the works of Prof. Guiseppe Marsala and Prof. Pascale Mei at Polytecnico Palermo as well as the master thesis by Chiara Ambroggi at Polytecnico Milano. The MOMA exhibition catalogue “Architecture without Architects” by Bernard Rudovsky, describes the ancient stone architecture of the Mediterranean as a more general phenomenon[12]. The excavated spaces of Matmata and Douiret in Tunisia relate to the cave dwellings of Matera in Italy just as much as Cappadocia in Turkey. Nowadays, the reference of traditional stone architecture finds an expression in a newly emerging practice which reconnects the disciplines of architecture and landscape. Represented by Ca´n Terra in Menorca, a dwelling situated inside an abandoned quarry, the architects of Ensamble Studio promote to rebalance comfort standards for the unique experience of living in nature[13]. On a material level, natural processes of erosion and sedimentation are beginning to change our perception of what architecture can be. While Studio Eidola experiments how to use sawdust from limestone quarries in the construction process of a building[14], Atelier Luma grows salt crystals for the facade of the Gehry Tower in Arles[15].

[9]“Building-in-Time. From Giotto to Alberti and Modern Oblivion.”
[10]Turpin, Architecture in the Anthropocene.
[11]Rocca, Gli indistinti confini.
[12]“Architecture without Architects, an Introduction to Non pedigreed Architecture.”
[13]“Ca’n Terra - HOUSE IN MENORCA.”
[14]“Studio Eidola.”
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Reflection

1) What is the relation between your graduation project topic, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)?

The Explore Lab Studio, as part of the Architecture track within the MSc Architecture, Urbanism and Building Sciences programme, offers a unique framework for students to define their own architectural fascinations beyond conventional project typologies. My graduation project—an investigation into the quarry landscapes of Favignana—naturally fits within this context, as it operates at the intersection of architecture and landscape, two disciplines that inform each other throughout my work.

This interdisciplinary approach is reflected in the diverse tutorship of my project. Under the guidance of Roel van de Pas, my design tutor and an integral part of Explore Lab, I was encouraged to follow a process-driven methodology, translating my personal fascinations into the architectural discourse. His counsel helped me to align my experimental ambitions with the formal requirements of the Architecture Master Track, while retaining the exploratory nature of the studio.

Complementing this, Laura Cipriani, a landscape architect, brought an ecological perspective to the project. Her mentorship emphasized the value of Favignana's quarries not only from the perspective of architecture, but as living ecosystems of flora and fauna. This broader lens connected my project to ongoing discussions about landscape architecure, which resulted in our joint participation in the "Borders of the Landscape" competition by UNISCAPE 2025.

Finally, Georgios Karvelas, as my Building Technology tutor, provided essential guidance on the practical implementation of my conceptual ideas. His particle advice helped me to bridge the gap between speculative design and structural feasibility, addressing aspects of climate and structural design.

Through this integrated approach, my project shares topics of circularity and sustainability with the future-oriented mentality of the master program at TU Delft.

2) How did your research influence your design/recommendations and how did the design/ recommendations influence your research?

The overarching parameters of location, temporality, and technicity form the conceptual framework that connects my research and design into a holistic graduation project. While my research focused on analyzing the excavated quarry spaces below the surface, the design project explored architectural interventions above ground. Together, they embody the Duality of Architecture that defines my graduation project since the very beginning.

Throughout the process, I adopted a research-by-design approach, where representation and experimentation acted as corresponding tools. The use of 3D scanning was essential to document and understand the spatial complexity of Favignana's quarries. This digital database not only informed my analytical research but also served as the foundation for my design explorations.

Furthermore, the material experimentation of my design project, working with salt, concrete, and erosion, deepened my understanding of how Favignana´s quarries were shaped. These

hands-on tests revealed how natural processes could be incorporated into a building process, directly influencing my design proposals. In this way, research and design became intertwined entities, which continuously informed each other throughout the whole year.

In retrospect, the interplay between representation and experimentation proved to be a powerful methodology, allowing me to overlay objective site data with intuitive, material-driven insights.

3) How do you assess the value of your way of working (your approach, your used methods, used methodology)?

Using 3D scanning and 3D printing, I developed a method of design that mirrored the quarry itself — subtractive and additive, analog and digital, intuitive and precise. These iterative tools allowed me to move fluidly between site and studio, between theory and practice. With 3D scanning I was able to capture the complexity of space, as found in the quarries of Favignana. This allowed me to establish my own research lens compared to previous investigations of the phenomenon of Favignana´s Quarries.

My fieldwork produced a qualitative dataset of approximately 100 scans, which directly informed my design process. Complementary to this, 3D printing allowed me to materialize digital data into physical models, enabling the exploration of how to translate void into mass.

While my hardware limitations, represented by my use of an iPhone and digital camera in combination with photogrammetry, influenced the precision of my scans, the approach could be optimised with more advanced technology like drones or LIDAR scanning. Despite these limitations, the process was highly efficient to develop a site specific project in Favignana while being located in the Netherlands.

Ultimately, my methodology has proven effective for my project and provides valuable insights into working with existing spaces. It has the potential to inform and inspire future architectural projects, particularly in adapting and systematising the use of existing site conditions.

4) How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

My graduation project examines the forgotten heritage of Favignana's quarries by highlighting their cultural significance and their potential for the island's future development. Beyond the local context, the project contributes to a broader discourse on post-extraction landscapes, drawing parallels with similar case studies in the EU, such as the limestone quarries of Mallorca and Malta. It provides valuable insights into how architecture can address not only human needs but also those of non-human actors. How can we rethink the architectural practice as a means to foster ecosystems that support both flora and fauna?

The experimental aspect of my project, the construction with salt and stone specifically, adds to the academic discourse on sustainable and alternative materials in architecture. The use of salt as a building material, while still in the early stages of exploration, has significant potential, especially as salt may become more abundantly available due to climate change. My graduation project suggest how salt can be used within an architectural language suited for the post anthropocene. While monolithic construction with salt and concrete remains still a

conceptual idea, my graduation project lays the groundwork for future research and exploration in that direction.

5) How do you assess the value of the transferability of your project results?

The transferability of my project lies in its site-specific research on Favignana's quarries, which contributes to the pool of research conducted on the island's cultural heritage. While my findings are rooted in this specific context, the broader spatial qualities and material experiments, f.e. the use of 3D scanning, 3D printing, and salt in construction, offer interesting topics to investigate further. These methods can inspire experimental architectural approaches, encouraging a new generation of architecture students to explore further, whether in similar contexts or as part of wider experimentation within the architecture discipline.

6 & 7) What would I do differently and what would I do next if I continue my project after graduation?

If I were to continue my project after graduation, I would focus on further developing the concept of building with salt and stone. While my graduation project is limited to small-scale models, I would conduct new experiments to test this concept at the scale of objects and eventually buildings. I believe that building with salt has great potential to explore sustainable building materials for the future.

Iff I were to start over my graduation project, I would place greater emphasis on the social context of my project. The language barrier, due to my limited Italian, hindered my ability to fully engage with the local community of Favignana. Conducting interviews with the residents could have provided valuable perspectives and insights that would have enriched my design process. It would have also helped to embed the project more deeply within the local context, ensuring its realism and feasibility for future testing in a real-life scenario.