Synopsis

This rapport constitute the first part of a long master thesis at the Architecture, Design & Media Technology (AD:MT) education at Aalborg University. In addition to this theoretical thesis the project contains a design proposal that grows in the knowledge from this thesis, put to use in a specific project.

The project deals with an architectural treatment of Urban farming in the 21. century. How should architects deal with the growing movement of Urban Farming and what can our profession add to the phenomenon?

In collaboration with the city of Aalborg, with a growing interest in Urban Farming, both from the citizens and from the planners at the municipality, the project proposes a way of dealing with a specific branch of urban farming, revolving around the water ways in cities.

The project deals with the creation of a facility that can nurture a rich culture based on the appreciation of the water and growing mussels in the city centre along the fjord in Aalborg.

Acknowledgement

Through one year long master thesis at AD:MT, I have had the pleasure of discussing architecture, Urban Farming, architectural space and many other interesting topics relevant to this assignment with a lot of different people. To those I owe great gratitude.

In the beginning of the project, a meeting with one of the initiators behind 'Maritime Nyttehaver' in Copenhagen, David Mouritzen, as well as a meeting with 'Dansk Skaldyrcenter' through fisherman Mark Lykke, sparked a great interest and created the framework from which the project was developed.

Through several meetings with the municipality, a great insight into the work with urban planning and Urban Farming on a city perspective, as well as insights into legislative framework and how this affects a phenomenon of Urban Farming was conceived. Especially my contact Annette Rosenbæk should receive this gratitude.

I will also like to mention the great team of supervisors across the different groups working with Urban Farming who again and again have attended presentations and workshops and provided valuable critique for the development of this and my fellow students projects. Also to the many outsiders who participated and let their views be known.

I have had the great pleasure of having my daily life among peers within Urban Farming and architectural interests. To the group of seven fellow students, a great appreciation to the daily talks and weekly meetings should be heard.

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Theoretical thesis

Theme

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1.0 Introduction

1.1 Motivation

Given the opportunity to spend a full year during my master thesis working with a profound project within the field of architecture, I recognized a chance to approach more intensive into a subject, which I find suitable for humans in the twenty-first century. In deciding upon a topic, I took point of departure in my own experience of the contemporary city, as well as my thoughts on how architecture should assist in improving everyday life.

I grew up outside a small town during the nineties, closely surrounded by nature, both lakes and forests as far as the eye could see. Thus I have always had an indirectly intimate connection to the nature around me and had almost ritual social occupations associated with every season throughout the year. In the spring my parents and I planted seeds in the garden that would grow and blossom during the following months and harvested in subsequent months. A swim in the chilling lakes with my friends during the hot summer months brought for us thrills and amusements as well as a sense of fellowship. I would go pick up fallen leaves and pine cones in the colourful forest in the fall, and during winter my brothers and I would spend several afternoons and nights sledging on the beautiful and fresh fallen snow. An appreciation nurtured by the natural means, but also by the spaces in nature. Since I changed from rural to urban lifestyle, this connection between the natural spaces, the changing seasons, and myself has suffered a severe decline. For me the cities often provide negative experiences in troublesome traffic and movements associated with seasonal changes and therefore I do not value seasonal diversity as I did in the past. When I look at the life in cities today with fast and efficient transportation and the excessive use of boring concrete and dark asphalt I feel that it is increasingly cut of from that part of life as I appreciated when I was a child. The connection to nature and the immediate appreciation of the resources provided by nature is gradually disappears behind superficiality of contemporary lifestyles. I believe that the ideal city should embrace both settings. A city should demonstrate peoples ability to live in coherence with nature, and from nature. The city should be the ultimate collision of culture and nature.

ill. 2: *The surrounding landscape from my childhood*

On that note I will introduce a phenomenon, in which I believe, could provide some of the connections that could start to improve the connections between culture and nature. Often referred to as Urban Farming, during the last decade this phenomenon has caught on to our cities and is increasingly more evident. In this rapport the phenomenon will be referred to as Urban Farming, while others have used the term Urban Agriculture. Local inhabitants are eagerly culturing food and other crops in pieces of fertile land forgotten or lost in the urban fabric. It represents the movement of producing food related products within urban boundaries, but as the notion is explored this definition proves to be insufficient. Urban Farming has been defined as:

"… an industry that produces, processes, and markets food, fuel, and other outputs, largely in response to the daily demand of consumers within a town, city, or metropolis, on many types of privately and publicly held land and water bodies found throughout intra-urban and peri-urban areas. Typically urban agriculture applies intensive production methods, frequently using and reusing natural resources and urban wastes, to yield a diverse array of land-, water-, and air-based fauna and flora, contributing to the food security, health, livelihood, and environment of the individual, household, and community" (Smit 2011, 1).

In this wide, and confusing definition, I recognize some of the same underlying values and motivations that corresponds with my personal reflection from above, but within the Urban Farming phenomenon interpreted in a thriving contemporary urban context. To me Urban Farming represent an authentic relation between humans and nature and the ingenious culturing of the resources and experiences provided by the spaces in the city. This becomes a very interesting meeting between culture and nature. According to writer and journalist Signe Wenneberg, the number of urban garden communities in Copenhagen grew from 10 to 60 from 2011 to 2012 alone (Dahlager 2012). In Aalborg, the municipality has provided foundation to four communities associated with different urban parks to grow crops within the city (Aalborg Kommune 2013b). It is thus reasonable to say that the will to incorporate Urban Farming is present among people from Aalborg and the Danes in general. But does Urban Farming possess potentials to constitute more than a corner in the local park?

The concept of Urban Farming has always been around in one shape or another due to the human necessity of food. Urban Farming, according to the above definition, covers a diverse spectrum of practices and no simple all-embracing definition can be uttered of the practice or of the practitioner (Smit 2011, 2). What I though believe is the essential for the phenomenon in order to reach its fully potential, is that it needs to emanate from the local cultural and traditional legacies. The potentials of integrating Urban Farming in the city fabric go far beyond growing food. The social aspect, the opportunity to express and live by sustainable values, awareness related to food quality, and spatial improvement is just as important. In order to address these potentials Urban Farming should be understood holistically, with the objective of integration with the city.

ill. 3: *Urban Farming practiced in a backyard in Copenhagen*

If Urban Farming should be understood as an integrated part of our cities the understanding of creating meaningful surroundings as well as the integration along other urban functions is needed. The mind-set of an architect and his ability to interconnect very different functions at the same time is essential in the further integration of Urban farming in the city fabric.

"While urban farming should not be reduced to a question of aesthetics, I believe planners and activists give too little thought to creating a meaningful landscape" (Ingersoll, 2013)
- Richard Ingersoll, Ph.D., Art historian

The issue stated above falls right into the discussion why architects should address Urban Farming architecturally. Architects and planners are trained in shaping the big picture in which every function has to work parallel and/or together nurturing from each other where the logical possibilities occurs. The more different functions can support and nurture from each other, the more integrated the city will be apprehended, easier understood and lived in. Furthermore architects shape spaces, which directly affect our comfort and well being in the city. This is necessary if a broad appreciation and use of the city is desired (Gehl, 2010, 27). Hence should Urban Farming not be reduced to something added on later, if the potentials should be met.

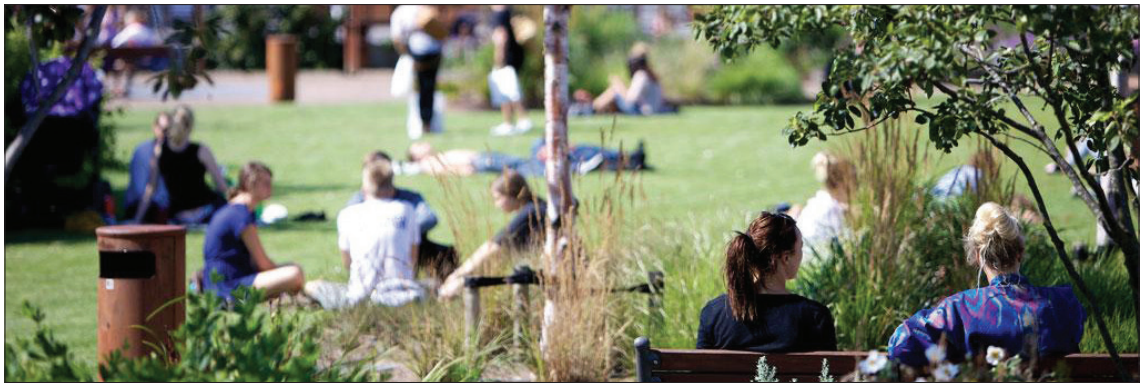
Aalborg municipality curated in the summer 2013 the exhibition 'Momentum.' This exhibition presented the planning direction from the city officials. The exhibition and the associated pamphlet, 'Fysisk Vision 2025', outline the boundaries and directions in which the city planning will be guided by the planners in the development of the city the following decades. Nonetheless they treated a great amount of subjects that can be related to Urban Farming and the implementation thereof in new, alternative, and more ambitious sectors.

All of the following comes from the pamphlet ' Fysisk Vision 2025'. The municipality emphasise that we need to soften the division between rural and urban areas in general, and future Urban development should be based on local qualities and cultural legacies. They see potentials in joining initiatives, thinking holistically, and embracing several functions at once, instead of separating. Holistic projects that use the spatial potentials of our natural surroundings will be preferred. A strategy for protecting and preserving nature, whilst using the resources provided by the natural surroundings is somewhat a keystone. The city centre should be rich on lively atmospheres, contain green areas for meeting and social gatherings, and entertainment and culinary experiences on a high level of standard.

New types of occupations in the city can through integration with the city even contribute to new attractive urban multifunctional use. Multifunctional can create new synergies and communities across boundaries as well as new and creative use of the city. They open up for the possibility of food production in the city, stating that it should be possible for niche production and branding of unique local products. Aalborg is still an old workers city, that's why they believe that all the above-mentioned visions should be rooted in this tradition of what makes Aalborg unique. As they state it: "*The tough little big city*" - Traditional workers culture in an international knowledge and network society.

From the guidelines above I would argue that conditions for an ambitious and innovative Urban Farming practice is present. The opportunity for diverse practices in different scales, integrated with other urban functions, and with different intentions could be the foundation for an ambitious symbiosis based on an Urban farming practice. Interdisciplinary, new types of professions, and combination of diverse functional, practical, and heavy knowledge-based employments is encouraged, which could form the outline for an innovative and new type of Urban Farming practice that is more ambitious than the urban garden in the park.

They state as a vision that the city should be developed around the Limfjord as the unifying blue element for the development of the city, outdoor activities and experiences, which correspond very well with their intention of rooting the city planning in the cultural and historical legacy. The Limfjord has always been a life- and job-creating element for the city, and Aalborg would never have evolved to the city it is if the fjord did not penetrate. The Limfjord took Aalborg out in the world and brought the world to Aalborg.



ill. 4: The newly created Jomfru Ane Parken on the new harbourfront in Aalborg

During the latest years the city of Aalborg, like many other both Danish and international cities, have undergone a change in the relation between the water and the city. This brownfield landscape has for years been on the highest architectural agenda. It is an intense zone of development plans and activation of the waters within cities. The reason for this can be assigned to the erosion of heavy industrial factories from the inner city which former occupied the large spaces adjacent to the water. These spaces are now highly potential in the increased attempt of contemporary cities to attract highly qualified labour, educational institutions, and cultural investments, because of the immediate placement within the city centre (Kiib 2007, 24). Today there is hardly a major city without a waterfront in transition from being dominated by industrial, to recreational activities. A transformation, which is flourishing in the city of Aalborg with north facing harbour front on the Aalborg side and a south facing harbour front on the Nørresundby side.(Kiib 2007, 30). Great potentials unfolds itself when dealing with these central and new urban spaces.

ill. 5: *Illustration showing the main harbour renewals taking place in the centre of Aalborg*

By introducing Urban Farming in these industrial harbour spaces as a part of the recreational activities, the harbour would retrieve some of its former production occupation but interpreted in a contemporary context involving the inhabitants as the practitioner. An Urban Farming project would be inspired by the historical and cultural legacy interpreted by contemporary lifestyle.

I will then propose an idea of not restricting the project to only stick to the harbour spaces. Why not take it one step further and incorporate the water itself in the production? Waters in the city holds a huge undiscovered potential in terms of food production, and the health and nutritional advantages of eating more seafood is profound (Harvard 2013). The facility could be an ensemble of aquaculture experiences, sustainable lifestyles, and production all related to the culturing of seafood. This will thread new waters, figuratively, in the Danish Urban Farming phenomenon, by introducing aquaculture to the concept of farming in the city.

Based on this idea the necessity for an investigation on the potentials of building an aquaculture practice in the Fjord unfolds. Aquaculture can imply various things, but in terms of maritime food production the Limfjord is especially known nationwide for its mussel productions. The fjord contains some of the Danish, and the world's best conditions for growing mussels and oysters and aquaculture farms are already present in the scape of the fjord. The fjord contains a rich amount of nutrition, there is sufficient shift in the water, and mussels are situated naturally. (Dansk Skaldyrcenter 2013b).

While investigating the potentials of culturing water and the initial reason for undergoing such a practice, research of the environmental advantages of mussel production uncovered itself. Research indicates that whilst culturing mussels in the water one of the natural benefits is that the shellfish filters the water it occupies from micro algae and nutrient and potentially reduces the risk of depletion of oxygen (Petersen 2010). It could therefore be stated that an aquaculture facility, would utilize the natural resources to create food, but at the same time help to protect and preserve the natural habitat. Following the visions presented by the municipality, a facility that uses the natural resources through its function, could be conceived to protect and preserve the nature as well.

An aquaculture production facility in the middle of the city partially controlled by the local inhabitants could manifest itself as a social icon of clean water preservation with the additional production of seafood. An architectural icon that represents the twenty-first century's renewed approach to a sustainable and environmental friendly lifestyle.

Objectives and delimitations

As an aspiring architect I am beginning to comprehend the substantial opportunities we possess with architecture, to shape and define the crucial spaces that stages and define human life. I believe that the potentials within this profession, this space-defining urge we all contain deserves to be unfolded in spaces that nurture life-affirming experiences and foster relations across distinctive individuals.

The phenomenon of Urban Farming features this ability and thus justifies, in my humble opinion, an architectural treatment. I don't believe that any single architectural project can change the human situation and thus save the world, but small improvements are equally entitled an existence and sometimes these improvements are the ones that really matter to the common man.

The objective of this theoretical work has been to identify potentials within an architectural treatment of Urban Farming, and especially urban aquaculture Today, restrictions against cultivating the water in Danish cities stops the idea from happening. But as the tendency goes towards a cleaner environment and water in the cities today, a preliminary position of the possibility for a future cultivation within the legislative framework has been taken.

The second objective of this theoretical thesis has been to dig into a specific architectural notion, namely architectural space. This notion was chosen as a subject based on own beliefs and interests.

These subjects are in this paper treated theoretically and in the following design proposal are they the notions in which the architectural treatment has sought out to create.

Based on this the following questions is the point of departure for this theoretical thesis, and the later design

What are the potentials of Urban Farming in a city today?
What is architectural space, and how should we as architects relate to it today?

Below is a collage unfolding the abstract idea into a tangible setting illustrating the initial atmospheric, social, and functional idea of the project. This image was presented as a poster on 'The Sustainable Festival' in Aalborg 2013 and has later been used for presentations.

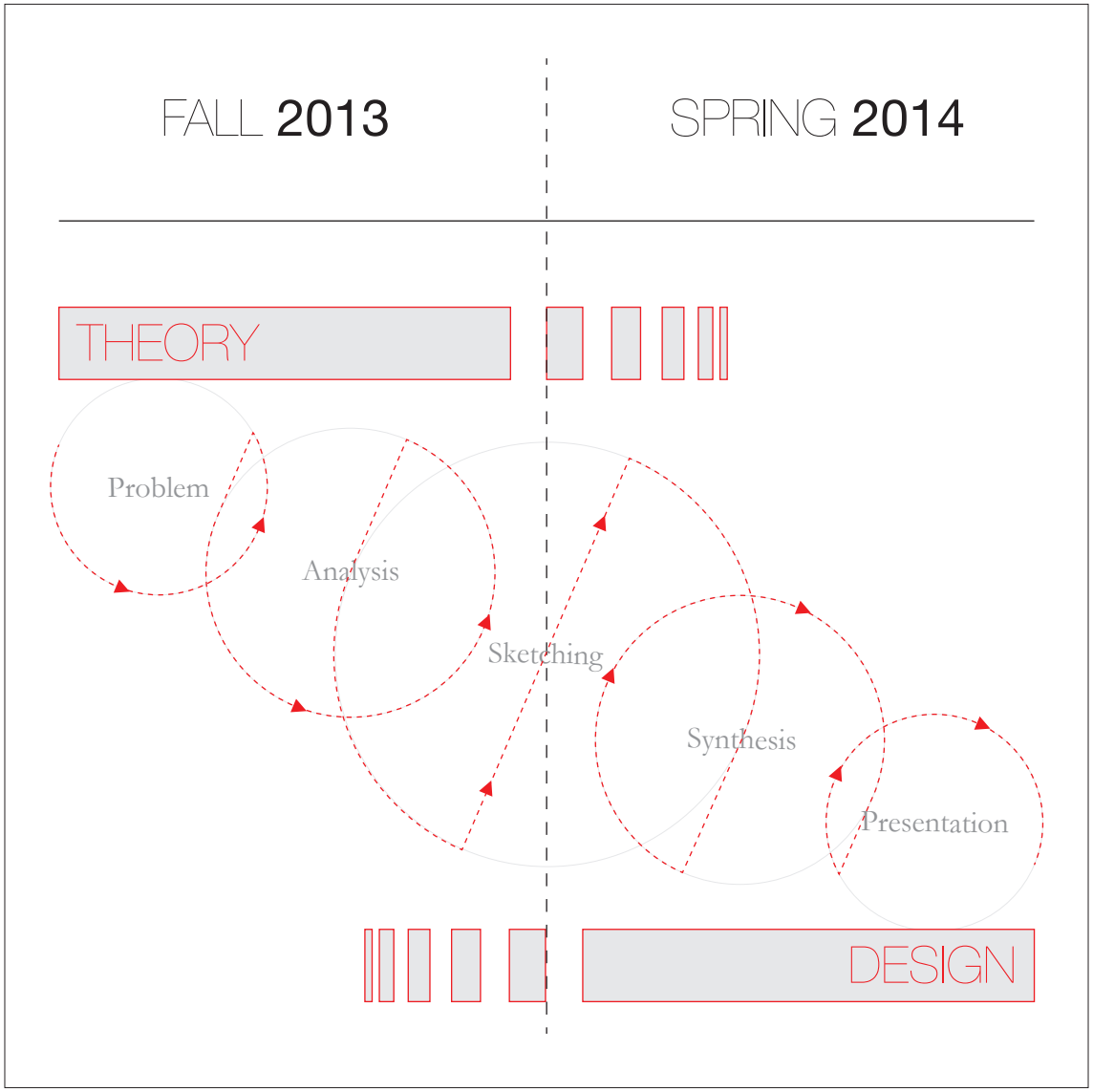
ill. 6: *Collage of a symbolic interpretation of the motivation.*

1.2 Method

The project is divided into two parts that consist of a theoretical part and a part related to a specific design proposal based on the framework compiled by the theoretical part. The theoretical part should likewise be based on the principles required for building up the proposal in the design part, thereby creating a symbiotic relationship between theory and design.

In order to reassure the unfolding of this relationship it is given to take point of departure in the preconditions of the project based on the motivation, and thence choose the essential areas of theory and research necessary for the development of the design. After a thorough review and elaboration of the theory chosen, a specific presentation of the projects conditions is then possible and from here the design part should be established. The investigations will be divided in two main parts, Urban farming investigations and spatial investigations.

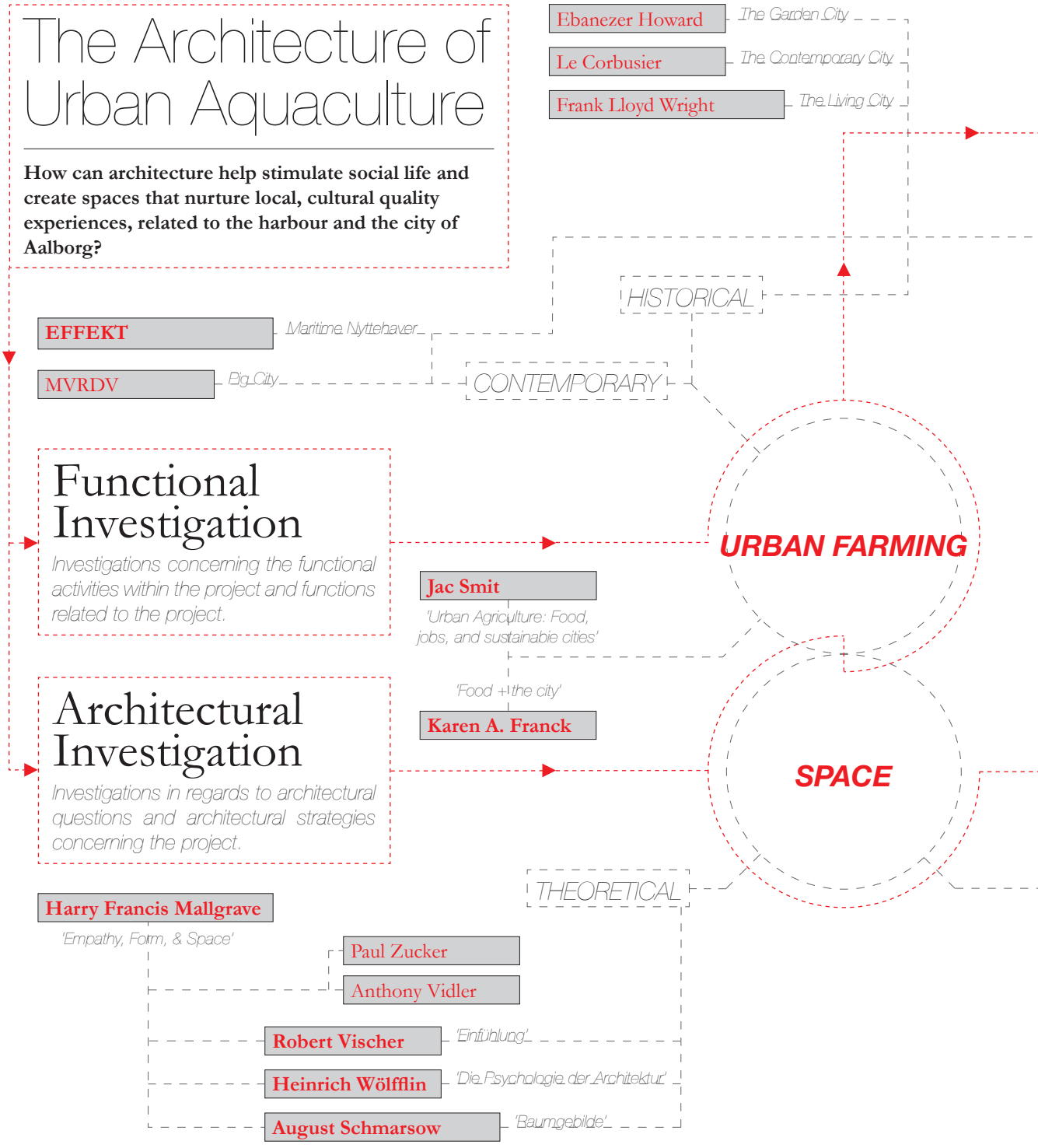
The overall method applied to the project is greatly inspired by the method developed by Mary-Ann Knudstrup 'Arkitektur som integreret Design', where the linear process is replaced by an iterative approach, repeatedly running through and back from the different stages in the process (Knudstrup 2003).

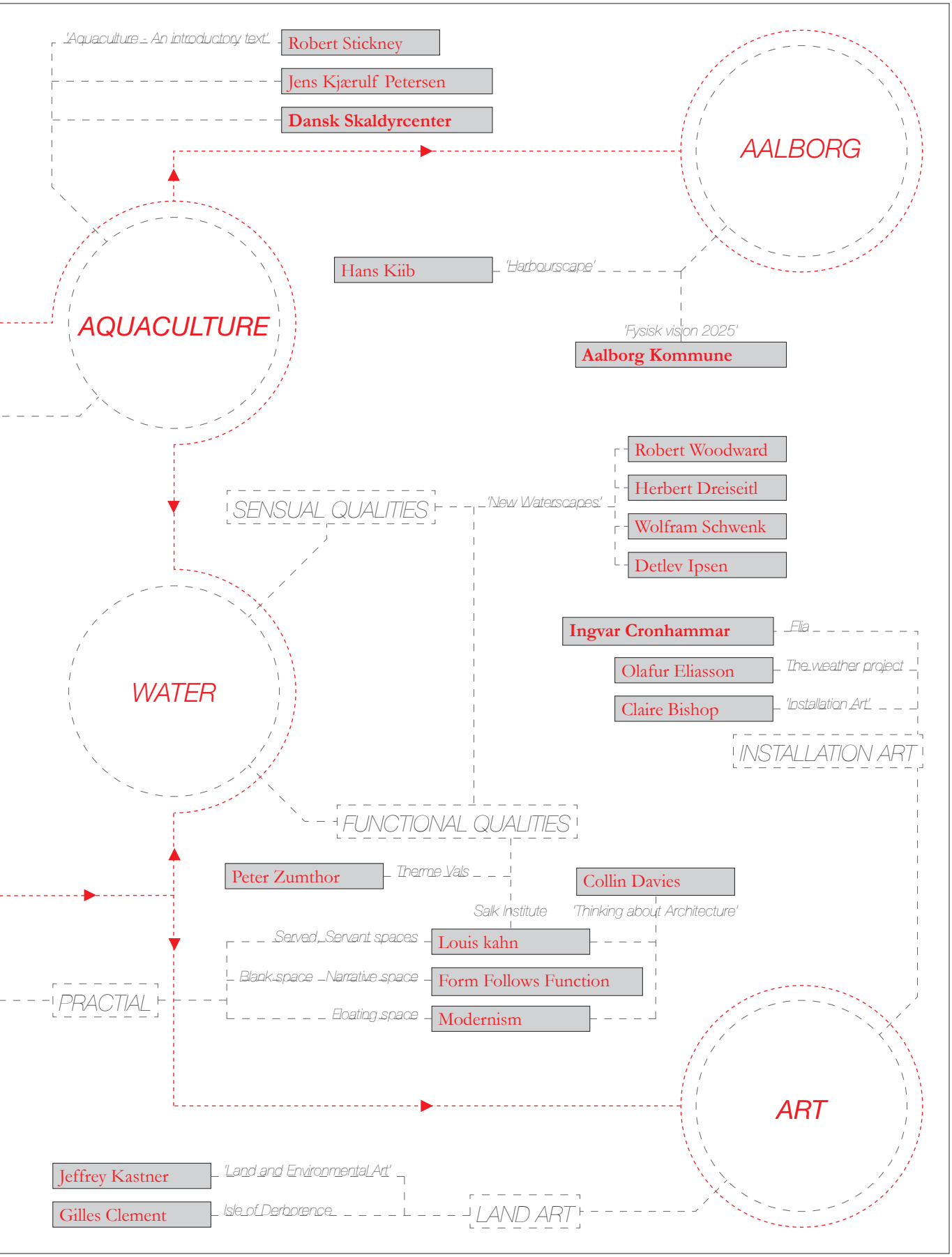


ill. 7: *The symbiotic relationship between theory and design and the approach of integrated design through iterative methods*

1.3 Knowledge map

The following map is a graphical illustration of the collected knowledge presented in the following rapport. The map is supposed to show from whom my understanding of the crucial subjects in this project are derived from and link the different case studies, theoreticians and theories, and notions and present it in an orderly and comprehensible manner.




'Aquaculture - An introductory text'
Robert Stickney
Jens Kjærulf Petersen
Dansk Skaldyrcenter
AALBORG
AQUACULTURE
Hans Kiib
'Harbourscape'
'Fysisk vision 2025'
Aalborg Kommune
Robert Woodward
Herbert Dreiseitl
Wolfram Schwenk
Detlev Ipsen
SENSUAL QUALITIES
'New Waterscapes'
WATER
Ingvar Cronhammar
Flia
Olafur Eliasson
The weather project
Claire Bishop
'Installation Art'
INSTALLATION ART
FUNCTIONAL QUALITIES
Peter Zumthor
Therme Vals
Collin Davies
Salk Institute
'Thinking about Architecture'
Served - Servant spaces
Louis kahn
Blank space - Narrative space
Form Follows Function
Floating space
Modernism
PRACTIAL
ART
Jeffrey Kastner
'Land and Environmental Art'
Gilles Clement
Isle of Derborence
LAND ART

2.0 Urban farming investigations

In order to understand the potentials of Urban farming, a thorough investigation into the phenomenon is desired. An investigation concerning inner ideals, motivational aspect of the culture, and benefits shall create the groundwork from which an architectural staging should approach the movement. This part is related to the functional use and more specifically how to introduce and interpret the term Aquaculture in an Urban Farming phenomenon including its potentials and limitations. Furthermore professional Aquaculture will be investigated in order to isolate the potentials associated with introducing the profession into the urban fabric. The investigations will furthermore incorporate historical and contemporary cases of small and big scale projects working with farming in an urban settlement.

2.1 Urban Farming

Urban Farming is as stated not a newly invented movement, and throughout the world the existence of traditional and contemporary farming practices within the city limit is evident. In Aalborg the easiest opportunity for committing to Urban Farming is, as mentioned, limited to four different societies accompanied with separate carefully chosen areas in four different city parks called 'Aalborghaverne' (Aalborg Kommune 2013b). This is initially a great service provided by the municipality for aspiring urban farmers, but as I see it the phenomenon Urban Farming has the potential of becoming even more ambitiously rooted in a city like Aalborg.

The following chapter on Urban Farming, Jac Smit, an American Harvard-educated city and region planner referred to as '*the Father of Urban Agriculture*', will be used as key reference. Jac has travelled all over the world and identified Urban Agriculture potentials and current project of all kind. All his studies culminated in the book from 1996 '*Urban Agriculture: Food, Jobs, and Sustainable cities,*' which due to its initial popularity has come to be the standard text on the subject of Urban Farming. The book has later been refined and the latest version was upon Jac Smit's death in 2009 released as a free e-book through his website. (Jac Smit 2013).

ill. 9: Picture of *Jac Smit from 2002*

Grasping the potentials of the phenomenon of Urban Farming in its entirety is a difficult if not to say impossible task. Maybe because of the assertation mentioned earlier that there hardly exists an easy understandable and accurate definition or description of what the phenomenon of Urban Farming covers. Just by looking at Urban Farming projects around the world one will find a vast amount of different approaches to urban food production.

Jac Smit mentions in his book the following as the most common examples of Urban Agriculture: Facilities for fish and aquatic products, community and allotments gardens in the public and private spheres, small areas of production of fuel, reeds, nuts and fruits, small animal production of rabbits, guinea pigs, chickens and so on, horticulture on spaces formerly dedicated to excessive activities such as airports and factories, vegetables grown on roofs, patios and stairways, and market gardens on available lands near highways, railroads in peri-urban areas. Great architectural potential arise from the projects already present, but integration in the city on a grand scale still appears somewhat unresolved. Jac Smit defines the core problem for this to be the societal prejudices and myths against the Urban Farming phenomenon, which could be related to the difficulties regarding a precise definition, and thus a somewhat foggy and ambiguous collective understanding.

The Myths he discovers among other things state that Urban Farming is only relevant to small production through household and community gardens or just for means of survival or food security. Other myths undermine Urban Farming to only be dealing with temporal activities, that it is unhygienic, and less efficient than traditional rural agriculture.

But in reality the phenomenon is quite different if looked upon in a global context. Jac Smit categorize Urban Farming as a nomadic profession occupying one plot until, due to vast amounts of different matters, the plot no longer is available and then moving on to the next. Thereby keeping some kind of stability in the overall production. Urban Farming constitutes of production in several scales and supplying a severe amount of people with food, indeed for means of survival and food security, but just as much for diversity in food culture and satisfaction in terms of freshness and local products. All around the world a vast difference in local markets in all sizes is the apparent evidence for this. Buying food from Urban Farming production could thus give a positive cultural experience, given that the production relates to some historical or cultural matter within the nearby district.

Hygienic issues will always be an important issue when dealing with the production of food, both in an urban or rural context. But within the city, Jac Smit explains that the unfolding of greater potentials of integrating food production with other functions, thus creating fertile symbiosis. Potentials especially apparent when urban waste management systems and urban food production are combined. In that context Urban Farming has the potential of contributing to the improvement of the overall sanitation in the city. Today we primarily dispose waste, but there exists huge potentials in looking at the city as a big coherent ecological cycle of waste where each part contributes to the growth of the next. Approaches like Cradle2Cradle is a thriving example of this philosophy that is beginning to influence policy makers, production facilities, and ordinary citizen worldwide. Urban Farming could contribute to closing the open loop in the ecological cycle by re-using and transforming by-products and waste from different suitable industries and reduce the amount of discarded waste, as stated by Jac Smit. The advantages are many in regards of using biological waste in Urban Farming production. It contributes to natural resource conservation, turns waste from problem into resource, and potentially removes cost from other urban systems handling waste.

Food production in general is suffering decline in terms of quality. Increasing amounts of additives and processing levels are applied to what we eat. The distinction between rural and urban in the policy-making system creates a situation where the chain of activities in producing food gets unmanageable. Food is just there, and the easy accessibility in the supermarkets obscures the underlying process (Frank 2005b, 37). Urban Farming could be the tipping point in which we started to apply more care to the quality of the food we produce and eat because of its presence in apparent context of the consumer. Jac Smit continues, the links between production and consumer would be severely reduced. Urban Farming helps making cheap and fresh food available to local customers due to a reduction in transportation distance compared to a traditional rural production. Because of this Urban Farming could help improve the health situation of local populations by making healthier food available for a cheaper price. With an adequate selection of product and an awareness of nutritional qualities, household gardens can likewise be expected to have beneficial impact on nutritional balance and micro nutrient intake of the farming household, and thereby also directly contributing to the health situation of the practitioners, Jac Smit states.

ill.10: *Urban Farming could be the tipping point in which we started to apply more care to the quality of the food we produce and eat*

An increase in Urban Farming, and thus an increase in green areas in the city, has a documented positive effect on human health and comfort as well (Clay 2001). Several empirical studies have presented research that indicates the positive effects on human well being and health solely by the presence of green areas in adjacent context of human residence. This point Jac Smit agrees upon, while others have made the adequate investigations proving the point. Research shows that just by passing by or having a brief view of plants and green in general positively affects the human sense of well being (Ulrich 2002). The environmental and health benefits of urban greening, and hence Urban Farming, are many. Examples include creating habitat for increased biodiversity of fauna and flora, modifications of natural micro climate, increased humidity and improved air quality in the city and thus improved sense of well being for the people living there, site for physical activities and natural places for human social life. The advantages are many, Jac Smit explains, and Urban Farming possess great potentials in heighten the average level of well being in the urban settlement.

ill. 11: *Urban farming could by introducing more green to the city increase the level of well-being in the city*

Another myth of the phenomenon states that Urban Agriculture could have a negative effect on rural agriculture. To this misreading Jac Smit argues that Urban Farming in general has an overall positive effect on rural agriculture because Urban Farming thrives on products that economically are less suitable for traditional rural productions. Urban Farming is judicious in its use of space, efficient in its use of water, and can in some instances produce a several times bigger harvest per square meters as rural agriculture. Furthermore Urban Farming activities could increase the average economy of the urban populations and thereby increase the demand for rural products.

Another aspect is that urban production in some instances includes processing of products from rural agriculture. The processing creates waste that could be obtained in the Urban Farming ecological system, making rural and urban farming nurture from each other and internal dependable. Hence it is difficult to describe the one without the other and great potentials unfolds in thinking the systems holistically.

Urban Farming should never aim at eliminating the super efficient quantity producing rural agriculture that several generations of hard working farmers have developed. Rural agriculture is the basis for our planets ability to feed large amount of people, and Urban Farming is at best a significant supplement, that could heighten the quality, and not the quantity (Todd 1984, 135).

As mentioned potentials occur when thinking the rural and urban system holistically, and thus creating a more intelligent and diverse food supplying system. Such a system would vary in regards to political, economical, and social conditions, and the benefits of promoting Urban Farming vary between countries, between regions, and between cities. Jac Smit argues that countries with a large food production for exportation could concentrate Urban Farming on feeding the city whilst the rural farmers focus on producing for exportation. And countries with no food export, supply the quantity producing rural farmers with Urban Farming products to create a more diverse production line and keep the rural productions focussing on the products available for great quantity production. The conceptual integration of rural and urban farming should be developed holistically, whilst the specific production should be developed according to the overall scheme, adding values and qualities due to individual abilities.

Beside production and quality of food, the phenomenon contains even more possibilities for enhancing the quality of social life in the city. The experience of food in the urban settlement is crucial as an argumentation for bringing it back to the city. When the food we eat, grow, or buy is local, we experience a connection to the region, the change of seasons, and the ground we walk. Our connection to organic life is strengthened through food, as it represent for many people the only natural and organic input in a stressed everyday life. Food in our city enriches our everyday sensations of sound, sight and smell through the staging of food in the street (Frank 2005a, 9). Food is a natural resource, which we take for granted, but it contains potentials for enhancing the quality of life in the city.

Several projects have stated that food production can work as a fertile social facilitator, creating surrounding for a flourishing social life. Especially children have been observed to acquire improved social skills when working with farming. Several school projects have shown that working in the garden provides a new and different way to learn. Connection with different things in life, working cooperatively, learning about quality in food, learning about ecology through observation, and social life between the practitioners are some of the potentials recognized (Frank 2005b, 39). It is easy to comprehend the immediate potentials in applying a social level in Urban Farming productions, people of all ages can relate to producing foods because it relates to the activity of cooking and eating in which we all encounter daily.

ill. 12: *Urban Farming*

Through a discussion of the exaggerated and misguided comprehensions and myths associated with the Urban Farming culture, it has become understandable that Urban Farming possesses great potentials for improving social, economical, ecological, health, human well being, urban functions, and food production issues. But as stated, as a mean for achieving these potentials architects need to work with the phenomenon and the city integrated.

In order to gain perspectives on how architects can address these issues and the phenomenon of Urban Farming simultaneously, examples of this would broaden the understanding of the potentials. The focus of the following, to some extent quirky example of Urban Farming and architecture, is how the architect by challenging an untraditional task can develop completely new concepts and visions by reinterpreting, integrating, and thinking projects holistically with the mindset and tools from the profession of architecture. This being the creative approach to design and the ability to adjoin dreamy pictures to visionary ideas of the ideal society. In the following the project Pig City will be investigated in terms of the architectural and planning potential of letting the architectural mindset deal with a task of feeding a whole city with the amount of pig meat devoured annually in a traditional European city.

MVRDV - Pig City

Pig City is a provocative, simple almost naive, project, based on the idea of containing food production within the city. Pig City has been developed by the subsidiary company The Why Factory under the Dutch architectural office, MVRDV in 2000-2001. The idea was based on the overall consumption and production of pigs of the Netherlands and presented as a reaction to the rise of different pig related diseases. In 2009 the idea was further developed through a master class at Delft University held by The Why Factory. The following is based on the project from the master class.

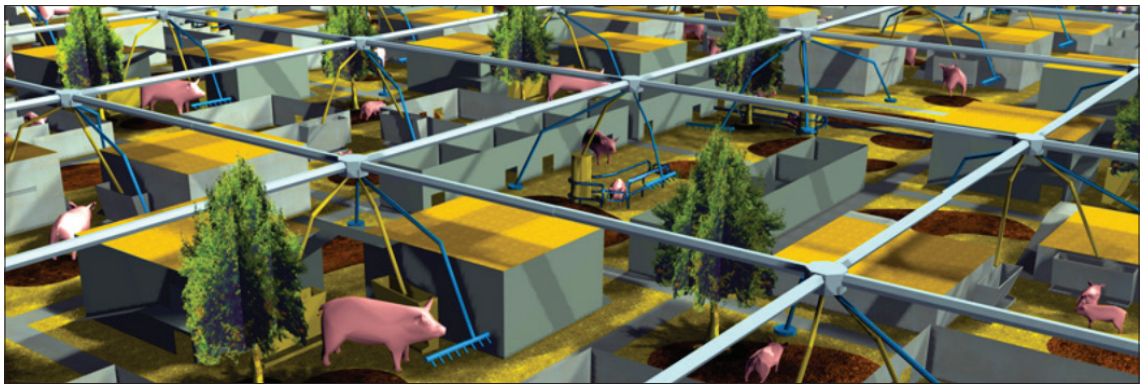
The project Pig City emerge from the Dutch city Den Haag and on the amount of pig meat the little under a half million inhabitants consume on a yearly basis. This amount could be translated into a certain number of pigs needed, how much space the pigs require related to regulations, including administration, biogas and slaughter facilities, and how much fodder the pigs need equivalent to a quantity of crop land. The space required is compared to the area of Den Haag, which result in the need of 174% of the city area is needed for crop land to feed the pigs.

With an economical perspective, they presume a minimum of 205 pigs pr. farm and divide the production into several farms equivalent to the minimum demand with the associated demand for fodder. By utilizing the possibilities by living in the city, they presume that processing the waste from the nearby food-industries, supermarkets, and fresh food markets could satisfy all the fodder demands. This would have a positive effect on the energy use and transportation related to abolition of waste, due to potentially handling within the city. They likewise propose to enlarge the biogas facility within the farm to handle the waste from the city, hence creating even more green energy for the city.

Based on this concept, the proposal contains several city farms that in different ways integrate with the city. One proposal is to stable the facilities on top of each other and cover the farm in a glass dome to minimize footprint and handle the smell the pig farm emits. Another proposal is the farm to be spread out in a green area with a lot of trees to obtain the smell and the noise and integrate the pigs in the urban life. A third proposal is a high-rise building, integrating the pigsties with offices and creates an airy building providing both pigs and humans with a magnificent view. A fourth proposal enhances the biogas facility even further exhibiting the facilities as an icon of green energy for the city, a pig power plant. The idea likewise contains examples of integrating the farms with other urban facilities like bridges, using existing office buildings, and use them for exhibiting the process of the pig production within the urban fabric as a city park.

"From piglet to sausage, is being exposed to the public"
(City Pig 2009)

A city like Den Haag would need 65 pig farms to reach the demand for pig meat. If the Dutch people would follow the recommendations, 12 farms is necessary (City Pig 2009). The project paints a picture of a coherent ideal imagined city, based on reality, where different systems are integrated and nurture from each other. At the same time the project presents a real concern on an easy understandable way, making it comprehensible to grasp by the ordinary person.



ill. 13: *Pig City by. MVRDV*

ill. 14: *Pig City by. MVRDV*

Pig city form a good example of how architectural investigations can outline new potentials within a field not initially involved with architecture. Taking a statement like the amount of pork eaten in the Netherlands, or Den Haag, and evolving it in to an architectural, extreme, vision on an urban societal level require a good amount of creative thinking in which architects are carefully trained in. And by joining these visions with images, pictures, illustrations, or movies, the message becomes stronger and easy to relate to. Even though this project is unrealistic in its current stage, the project propose a significant question, regarding the production of food.

Based on this my understanding of the potentials of the phenomenon of Urban Farming movement in relation to architecture and the city:

Urban Farming has the potential of becoming the next phenomenon that demand a paradigm shift in how we plan, design, and live in our cities.

Pig City represents a specific example of a singular architectural proposal, but Urban Farming as presented earlier has larger potentials in integration with the city. Architecture and planning has the ability of defining new possibilities through integrated planning (Doron 2005, 59). Architectural intervention has the potential of making Urban Farming a more convincing part of contemporary life and change the face of our cities.

Architectural history has presented great proposals for holistic city planning involving architects and planners working with the potentials of incorporating food production within the urban areas. These ideal projects where conceived by exemplary great minds and can be seen as ultimate manifestation of the architects world view. In the following three of these projects will be briefly described in order to understand a historical perspective of city planning related with food. These projects are 'The Garden City' by Ebenezer Howard, 'The Contemporary City' by Le Corbusier, and 'The Broadacre city' by Frank Lloyd Wright. They were chosen because of their visionary extend, and because they all had ideas of integrating living and food production.

The three master architects and planners were in each of their different way geniuses and wanted from each of their respective experiences to better the city that they have come to hate, and as spectators did not hesitate to judge as being in decay. The city was the hell that inspired their heaven. They wanted to consider the complete urban scheme as a whole and understand the logic of the twentieth century city, its structure, and most efficient form presented in an architectural scheme that would comprehend the complete idealistic utopia. They build their schemes on individually selected technical advancements that inspired their age, the new building possibilities and faster transportation (Fishman 1977).

These three planners stood out from the numerous other examples of utopian city planning on the fact that they all tried to execute their proposals in realistic projects all around the world. The projects were represented in both drawings and endless amounts of text explaining everything from living room design to the overall economical structure of each of their respective proposals. They believed they had the tools to solve the urban as well as the social crisis of their time through the ideal cities they imagined. Hence the level of ambitions and complexity were high. The model cities were in each of their different way manifestos for Urban Revolutions (Fishman 1977, 3-4).

Ebenezer Howard - The Garden City

Ebenezer Howard experienced the city of his time as obsolete. The social conditions for the city had changed and the city could not keep up with the demand from the increased urbanization. The cities as they stood had done their job and now he believed that new cities should grow out of the demands from a new and contemporary life (Howard 1985, 6).

The Garden City can be described as a plan for a moderate decentralization and cooperative socialism. He wanted to create new cities, limited in extent and inhabitants on new and fertile land. The city would be surrounded by a green belt be compact, efficient, healthful, and beautiful (Fishman 1977, 8). He imagined the whole country being build up by these cities, interconnected with a highly developed infrastructural system in terms of high-ways and railroads.

His approach to designing the Garden City was to unite the qualities from the city with the qualities from the countryside and create a new phenomenon, the town-country. The contemporary city having high wages, excitement, job opportunities, but unaffordable rents and poor living conditions whilst the beautiful countryside suffered from weak economy and lack of amusements. He wanted to combine the greatest from both and create towns with good wages and affordable rents, beauty of nature and lots of excitement along with quality in living spaces, freedom, and cooperation.

The vision was drawn as a diagram, consisting of three magnets representing the attraction and repulsion of city and countryside, where the Town-Country represented the best of both. (Howard 1985, 8-11). He sees this as the combination of culture and nature and as he describes it:

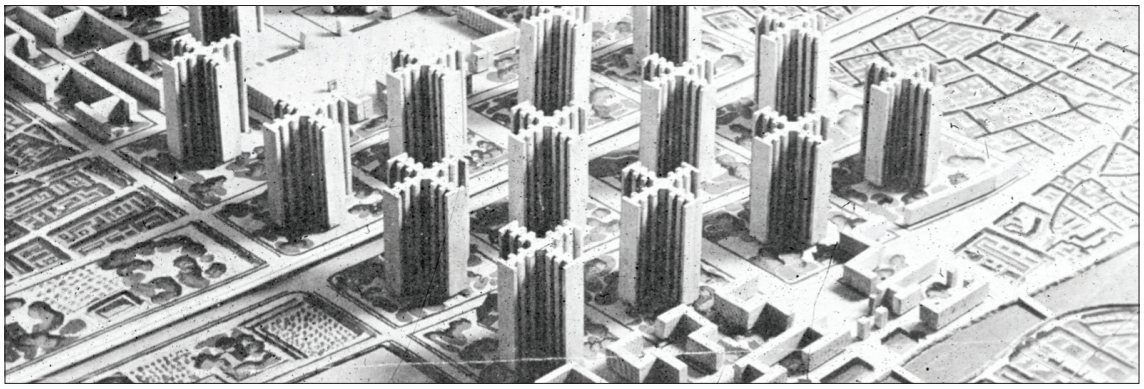
> *Town and country must be married, and out of this joyous union will spring a new hope, a new life, a new civilization.*
> (Howard 1985, 11)

In terms of agriculture, Howard imagined a large belt embracing the city cultivating the land and producing all the food the city needed. The production would be conducted in a range of different social manners, ranging from cooperative farms to individually produced products. Farmers would be able to sell their products in the markets in the town close to the production, due to the limited scale of the city, but also be able to travel on the highways to a nearby town to sell. By creating this easy accessibility for the farmers to produce and sell their products, the fundamental situation will better the conditions for the agricultural life (Howard 1985, 18). The food system was highly integrated with the system of the city, and food production was imagined as an important part of the majority of citizens.

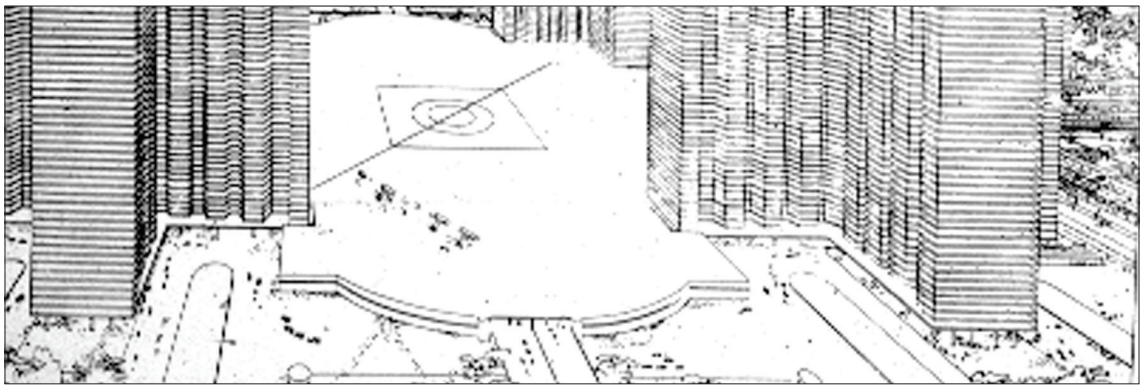
ill. 15: *Diagrammatic rendering of the Garden City by Ebenezer Howard*

Le Corbusier - The Contemporary City

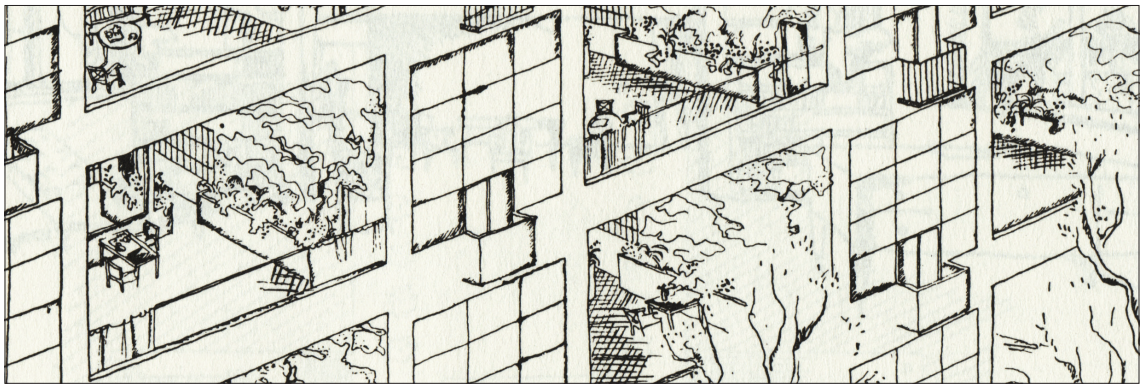
Le Corbusier dealt with the opposite approach but faithful to the same believe in industrialization. Corbusier believed in the increased dense city, he believed that large bureaucracies could coordinate production from enormous skyscrapers of glass and steel in the city centre, and centralized management could bring the city beauty and prosperity, leaving the labourer to live in garden city suburbs. He believed in a completely planned society, based on geometry and symmetry (Le Corbusier 1971, 171). He designed the city like a factory, first analysing the various functions, assign different spaces to each, and last join them in the most suitable way. Extreme modernism. Le Corbusier would contain all needs to a complete life within a single skyscraper; the machine for living, and social rank was defined by the amount of privileges accompanying your skyscraper and not the apartment itself (Fishman 1977). By the foot of these urban machines, parks and gardens would occupy the spaces and surround the buildings. (Le Corbusier 1971, 177). Furthermore the suburban apartment was optimized to make room for adjacent, less time-demanding vegetable gardens and thereby turning all the inhabitants of the suburban garden cities into agricultural producers (Le Corbusier 1971, 205).



ill. 16: *Architectural model of the Contemporary City by Le Corbusier*



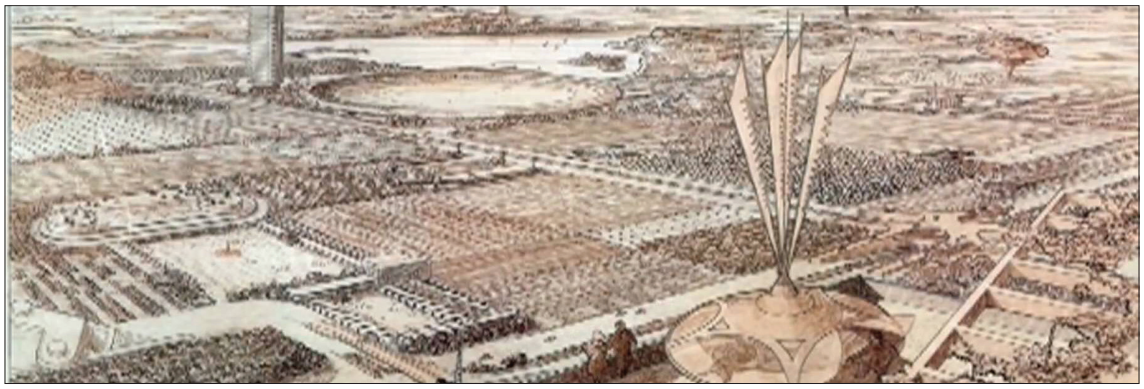
ill. 17: *Sketch of the Contemporary City by Le Corbusier, showing the scale of the buildlings versus the city*



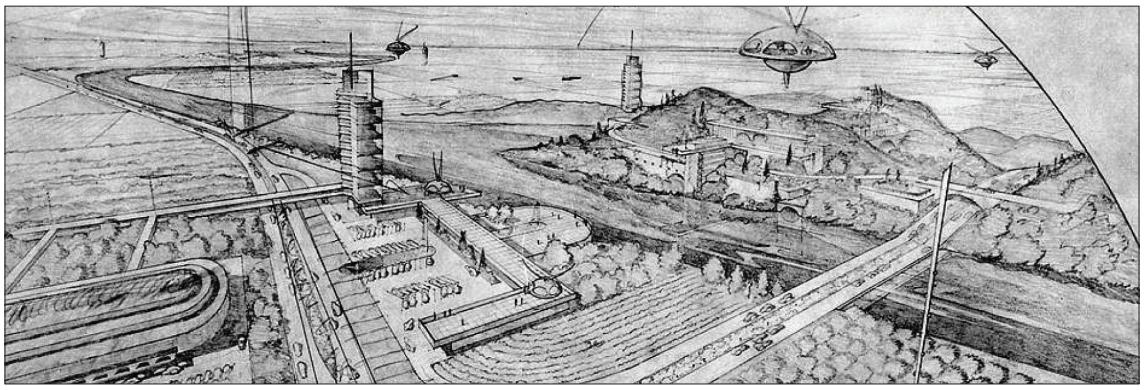
ill. 18: *Skecth of the private gardens in the Contemporary City by Le Corbusier*

Frank Lloyd Wright - Broadacre City

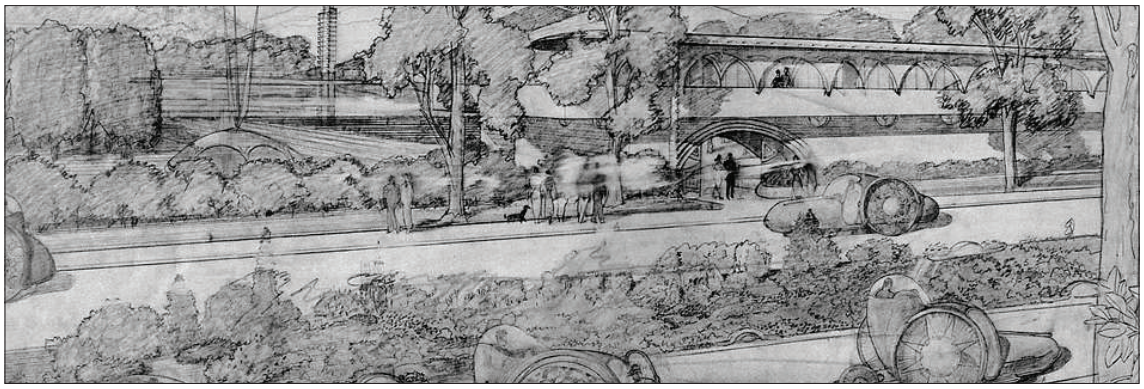
Wright based his city scheme on individualism and decentralised his 'city' to the unrecognisable. He scattered the buildings until the relationship between rural and urban stopped to exist and the man-made structures ended up becoming a part of the organic nature (Fishman 1977). Some sees his project as the ultimate combination of nature and culture. Between the scattered houses super highways with magnificent service stations that could facilitate all car transportation linked the complete scheme together (De Long 1998, 26). The scattering meant that no city control centre was applied, and the majority of social life revolved around the family. Agricultural speaking everyone had the right to own as much land as needed, at least an acre per person, and the countryside would be covered in thousands of homesteads. Almost everyone would work part-time on the family homestead and part-time in small shops, farms, and industrialized factories shattered among the homesteads (Fishman 1977). This meant that every man was at least a part-time farmer in his or her own homestead and hence providing own food production. He defined building size according to how many cars it facilitated, one to five cars, but the core of all buildings, was the farming unit (De Long 1998, 66).



ill. 19: *Drawing of the Living City by Frank Lloyd Wright, showing the fields and the decentralization of the city.*



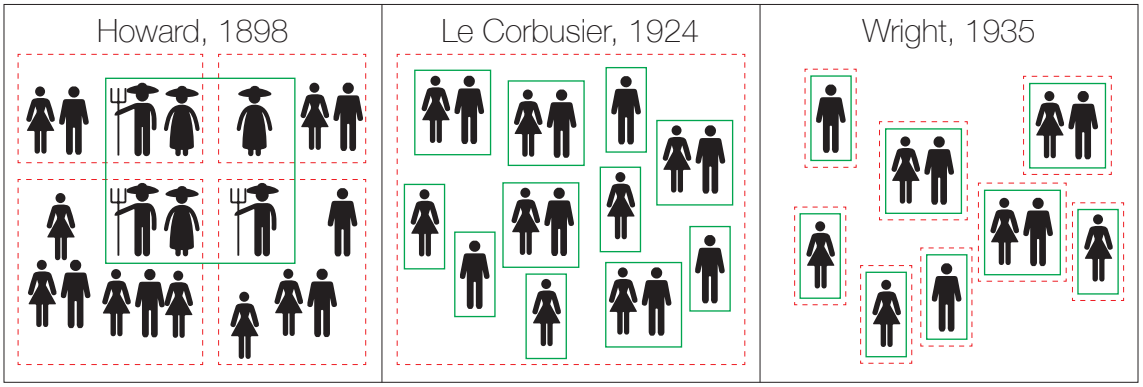
ill. 20: *Drawing of the Living City by Frank Lloyd Wright, showing among others his view at technology in relation to nature*



ill. 21: *Drawing of the Living City by Frank Lloyd Wright, likewise showing his mix of nature and technology*

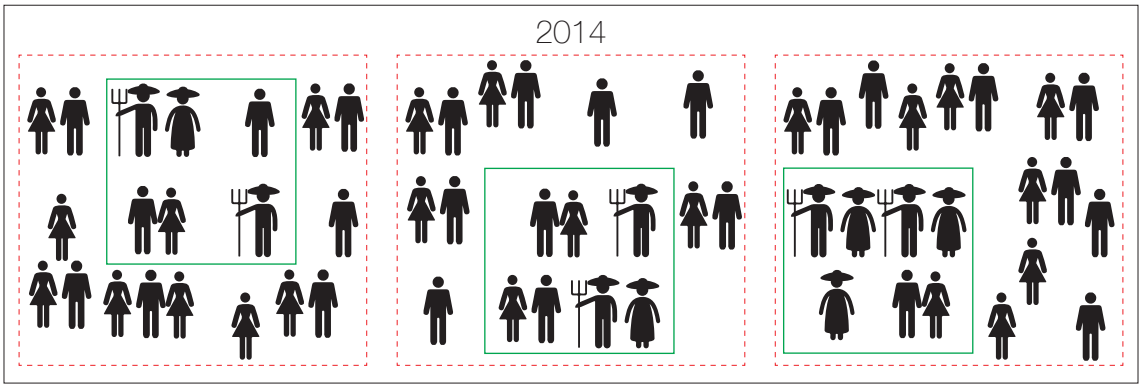
Diagrammatic comparison of the three city plans

Below is a simplified diagrammatic representation of the approach to city planning of the three cases expressed in relation to food production in the city. The red boundary represents the content of the society and the green boundary represent the food production unit



ill. 22: *Conceptual illustration showing the relationship between food production and society in the three historical cases*

It is evident that the professional farmer were excluded and replaced with solely private production in the schemes from Le Corbusier and Wright compared to Howard's. Based on the previous chapters in Urban Farming and the potentials of combining the food producing system, I believe that this person needs to be reintroduced to farming in the city and in collaboration with private producers form a symbiosis that can reinterpret food production and society. This idea is illustrated diagrammatic below.



ill. 23: *Conceptual illustration showing the relationship between food production and society in the project at hand*

The above illustration shows the diagrammatic approach of the proposed contemporary urban food production. This idea is summarized in the following:.

Food production in the city should on local production and a joint cooperation of private and professional farmers

Historically each of these projects has had great impacts on the development of our cities. The Garden city is still being used as model for cities built in Great Britain and the US, and the contemporary city was a manifestation of the functional city developed through Modernism. Broadacre city was a manifestation of the American dream, the individualism associated with the Jeffersonian legacy (Fisher 1977, 94). Each of these projects could be significant elaborated, but focussing on the topic at hand, these examples can teach us something about agriculture in a holistic planned city. This is not the comparison in which great emphasis has been put earlier, but today, this investigation seems increasingly relevant. The utopian touch in these projects is important for the idealism in ideas of this significance, but a more realistic, contemporary agriculture scheme would put the subject of farming in the city in a more realistic sense. 'Maritime Nyttehaver' from Copenhagen is chosen as case study due to its resemblance in location and culture with the design project at hand.

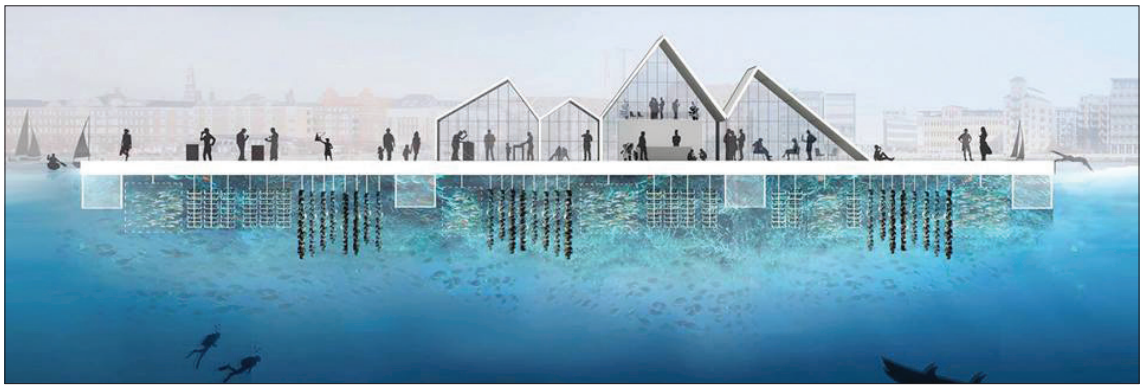
EFFEKT - Maritime Nyttehaver

'Maritime Nyttehaver' (Maritime allotment gardens) is a specific aquaculture project in Copenhagen slowly but steady realising its fully potential. What started as an fun idea of growing a single rack of oysters in Copenhagen Harbour has after two years developed into a local movement with a pilot architectural proposition for small and large scale physical and functional manifestations. Furthermore they have conducted a thorough study of the water quality, and the first generation of mussels and oysters have been growing in the harbour from the summer of 2013 (Harbourfarm 2013).

The motivation to start practicing aquaculture within the city limit was to broaden the interest for the local inhabitants based on user involvement. They recognized great potentials in developing the idea with a wish that it would evolve into the next great beacon in branding sustainable living in Copenhagen following great icons as the bicycle and the harbour bath has been. They argue that it is important for people to understand the ecological consequences of their actions, and they believe by placing a food producing facility in the middle of the harbour in Copenhagen people would start to understand the environmental and food-related results of water pollution, and thus contamination in general (David Mouritzen 2013, interview, 30 Mai).

Maritime Nyttehaver consists of private and business partners in an association united with a single goal: To use the nutrition already floating through the harbour for producing oysters, mussels, seaweed, and fish for the people living in Copenhagen. The inspiration is derived from sustainable movements concerning production of food locally as well as an increase in the desire for self-sufficiency among the citizens. They likewise recognise great potentials in creating experiences in new urban spaces related to the water for the inhabitants of the city (Maritime Nyttehaver 2013).

Quite early in the process the initiators teamed up with the Danish architectural office EFFEKT and joined forces with vision of making this project a reality. EFFEKT constructed initial drawings and illustrations to the shared ideas and made the abstract ideas tangible for the common man. After several meetings with the municipality, several stakeholders, organizations and community meetings they presented a prototype for a highly ambitious project, and a pilot project for a smaller, less ambitious in order to encourage a discussion related to the level of determination from the partners. As for now, the project is unresolved, but the union struggle to get the necessary means to realize their dream in the nearest future.



ill. 24: *Maritime Nyttehaver by EFFEKT*

The project, as shown in the illustrations above and on the following page, consist of floating deck known from the adjacent harbour bath likewise placed in the Copenhagen harbour, with a building placed on top of the deck. Within this building different functions to accompany the facilitation of aquaculture in all of its aspects are provided, such as class room, cafe, meeting hall, cooking facilities and so on. By being a pilot project the current stage of the scheme is affected according to the detailing and other refinements needs to be treated before a realisation is possible. And the proposal suffers from the fact that no specific site has been chosen for the placement of the facility, hence the spaces and the relation to the water and the city in the current stage of the project are not completely designed. Later iterations would undoubtedly propose these concerns as well. Nonetheless the project illustrates a lot of potentials in terms of fulfilling the visions of introducing aquaculture to the city of Copenhagen, and the movement is weekly reaching new grounds.

ill. 25: *Maritime Nyttehaver by EFFEKT*

In the last pages, potentials of aquaculture in the city have been described. The potentials of the phenomenon of Urban Farming can influence the overall social, economical and ecological situation of the city. Investigations have shown that citizens will experience an increase in health and well being and that urban farming can add new urban functions related to social interaction.

Pig City was used as an example on how architectural creative approach to designing the city could transform the simple idea of producing sufficient amount of pig meat within the city limit, to a holistic approach in which the production facility is integrated in the city in several different ways. Furthermore the pig city vision, illustrates the potential of visionary dreams presented by the tools of an architect in a pictorial manner. The creative process and the pictorial presentation represents the ways in which architects can influence the surroundings.

Different ideas of integrating agricultural production within the city were presented in the great ideal cities by the three masters of city planning. Le Corbusier and Frank Lloyd Wright each worked with the integration of food production to all housing units in respectively a dense and decentralized urban planning scheme. They both saw food production as a part of the private life and should be a fundamental and integrated part of every household. Ebenezer Howard on the other hand aimed at making food production a more social approach, and distributed the responsibility across a bigger part of the citizens. The large-scale food production was completely integrated and imagined being a very important part of the city.

Each of these projects contains interesting and great ideas related to food production in the city, but the idealistic conditions demands detailed and realistic interpretations in a contemporary city. Maritime Nyttehaver'is an example of this in a small scale. It is a realistic contemporary project, based on the creative approach and visionary pictorial presentation related to the architectural practice. 'Maritime Nyttehaver' is placed in between the approach presented by Howard and the ones by Corbusier and Wright. The production is related to production on a housing scale, but in a social manner.

The following statement summarize the outcome from the previous chapter:

Architectural tools and creativity contains the possibilities to further enhance the potentials of Urban Farming and integrate the qualities within the city

Going from a more generalised state of the phenomenon down to a more specific area of Urban Farming related to the subject of the design, the following section will investigate the conditions and potentials of aquaculture in the city.

2.2 Aquaculture

To specify the investigations according to the subject of the project Aquaculture, the culturing of food-related products in water, will be the subject for the following chapter. This may be the most specific kind of Urban Farming due to the limitation being in the medium of water. Despise that, Jac Smit has recognized Urban Aquaculture as being the fastest growing kind of Urban Farming worldwide during the last decades. Potentials within the phenomenon would demand a more thorough investigation regarding production methods, potentials and limitations in aquaculture in the urban settlement.

One of the widest used definitions of aquaculture is:

"Aquaculture is the rearing of aquatic organisms under controlled or semi-controlled conditions"
(Stickney 2009, 1).

ill. 26: *An aquaculture facility*

Aquaculture has been developed over the last 5.000 to 6.000 years and by many believed to originate from low practical systems of holding carps in underwater baskets in ancient China or oyster farming from Japan. Through human history traces of intensive aquaculture can be seen in different cultures including the Roman, Egyptian, and Hawaiian. The technological breakthrough happened in the late nineteenth century, where pioneer cultivists from Europeans and North Americans started to apply more scientific methods to production (Stickney 2009, 6). Today aquaculture productions comprise highly refined technological methods of culturing more than 200 species of fish and shellfish (Tidwell 2012). But the methods are more or less similar to the one practiced by the pioneers in the late nineteenth century (Stickney 2009, 7).

Seafood contains some of the most important proteins for humans and the average intake has been rising through the last fifty years. Contamination, overpopulation, and other causes to natural habitats have made the seafood demand too big for natural fishing to comprehend and therefore has aquaculture production been in solid growth over the same period of time (Tidwell 2012). This tendency is expected to continue. Projections are saying that the global demand for seafood products will rise by 70% in the following 30 years, which make urban aquaculture even more interesting when talking about addressing demands (Dewey 2011, 33). Beside the culinary experiences and health benefits associated with eating more seafood, Jac Smit states that due to the fragile ecological systems in aquaculture they require great care in order to thrive. It is very important to keep proper control of contamination levels to prevent the food from having hazardous effects on human health. But in the latest years, research have revealed great potentials within aquaculture. Waste contaminated wetlands and water bodies in the city, can be biologically treated with aquaculture. Studies from water in Sweden have shown, that especially shellfish, and thereby mussels, have huge potentials in filtering for nutrition and micro algae (Petersen 2010).

"...mussel farming can be used in managing and compensating for nutrient discharges in nutrient trading schemes."
(Lindahl 2011, 217)

This means that mussel productions can help preventing eutrophication in wetlands and waters. From an environmental point of view, mussel farming can be associated as the in sea equivalent of 'open landscape feeding' on land - An ecosystem that reinstates waste from another systems into its own. In the case of mussels, the result is clearer water because the biomass of phytoplankton has been harvested and utilized in the growing of the mussels, which can be used as seafood, feedstuff, or fertilizer instead of having potentially severe negative environmental effects on the ecosystems (Lindahl, 2011 219).

Some consideration is associated when choosing the right placement for an aquaculture practice when the intention of biological cleaning of water is in mind. Wetlands are sensitive in terms of habitat and biodiversity, and harmful practices could cause severe damage on this Jac smit states. But still for an optimization of the effect, a practice should be set up close to emission points. Aquaculture compared to agriculture takes more attention to maintain. The farmer has little or no way of manipulating the ecosystem, and relies completely on the ways of nature. This likewise demands on going studies and research of the local conditions and environment and a facility that is adaptable to change and sudden adjustments.

ill. 27: *Aquaculture facility in the city*

The former investigations represent the immediate potentials applying aquaculture to a general urban settlement. These potentials will in some version likewise be of importance if introduced to the city of Aalborg, but they should be combined with a more specific investigation into the conditions related to the waters in Limfjorden and the different kinds of seafood potentially cultured. This investigation will be based on an interview with a marine worker employed in the Dansk Skaldyrcenter on Mors located in the middle of Limfjorden, as well as educational information provided by the very same institution through their website.

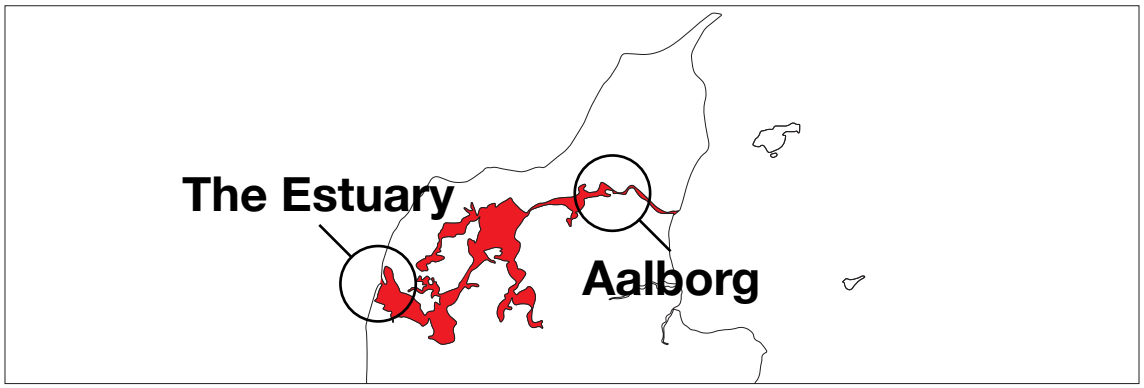
Aquaculture in Limfjorden

'Dansk Skaldyrcenter' is a national research-, dissemination-, and experience centre that focuses on shellfish from Limfjorden nationally and internationally (Dansk skaldyrcenter 2013a). They possess knowledge of local conditions in Limfjorden in relations to ecosystems and potentials in aquaculture methods and production.

Historically the conditions for mussel and oyster fishing have changed drastically through huge occurrences in the natural landscape during the last thousand years. In the medieval time around the year 1100 the estuary from Limfjorden to the North Sea was concealed by sand, which caused the water to desalt and thereby completely change fish and shellfish conditions in the water. This had devastating effects on the thriving oyster population, which completely disappeared and didn't return until a stormy night in 1825 where the North sea yet again penetrated the estuary. These occurrences represent rare but vast changes in the history of Limfjorden, but small local alterations due to changes in the adjacent creeks and rivers are happening at a frequent rate.

Because of the high status in fine dining circles, the oyster has been most intensively cultured and ever since the penetration oyster production in Limfjorden has been granted the highest status in Denmark (Dansk Skaldyrcenter 2013b). Fishing methods have likewise changed a lot during the years. From scraping the bottom of the sea with heavy tools, which had damaging effect on the ecosystems of the seabed, to diving methods have been practiced. The amount of oysters present in the water has varied severely through the years.

Mussel fishing on the other hand had other conditions. If was not until the food shortage during the First and Second World War that mussels were associated with human food. But during the war the mussel fishing industry in Limfjorden exploded and brought in enormous economical benefits. During the last decade the commercial fishing has been supplemented by breeding facilities but despise this, the general Danish population have not learned about the health potentials and culinary experiences by eating more seafood, yet (Dansk Skaldyrcenter 2013b).



ill. 28: *Northern Jutland with Limfjorden in all of its unfolding marked in red*

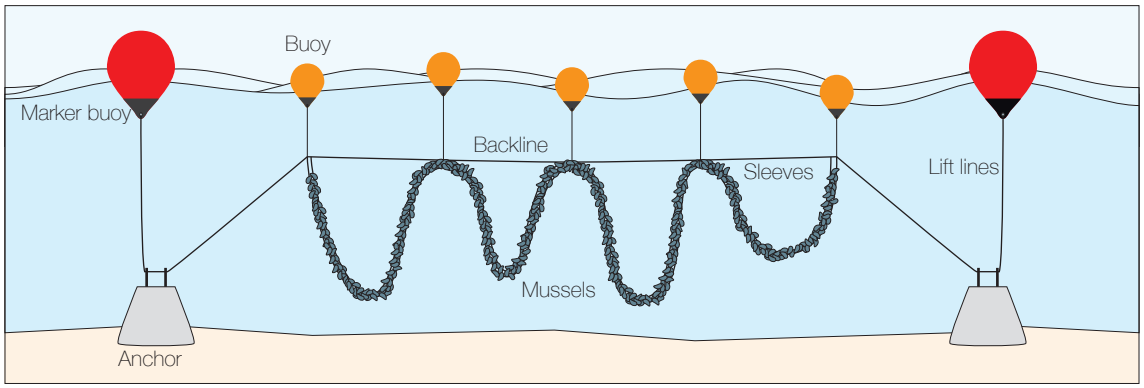
The water flow, called the hydrodynamic, through Limfjorden has a huge influence on the ecosystem in the water. The unique ecosystem in Limfjorden today constitutes of salty seawater from the North Sea with a mixture of freshwater from small inlets or fjords from the adjacent areas. The average amount of water flowing through The Limfjord has been estimated to being up to 8.000-10.000 m3/sek. Because of the slight difference in density of freshwater and saltwater, freshwater being the lightest, the water mass often flows in layers, and sometimes in different directions. Only in connection with the wind the water mass is mixed together. In the middle of the fjord the freshwater inlets are biggest which means the division of water mass occurs more often. Aalborg is placed predominantly to the east according to the geography of the fjord, which means that a division of water mass could be expected here occasionally.

The division could be a problem for the faun and flora of the ecosystems. A lack of water mixing would prevent oxygen to be transformed to the lower water layers, which consequently will suffer from oxygen depletion and thus destroying conditions for life on the seabed (Dansk Skaldyrcenter 2013b). This potentially could be a problem, but as stated, mussel production could be a realistic mean in preventing oxygen depletion (Petersen 2010).

Aquaculture breeding techniques

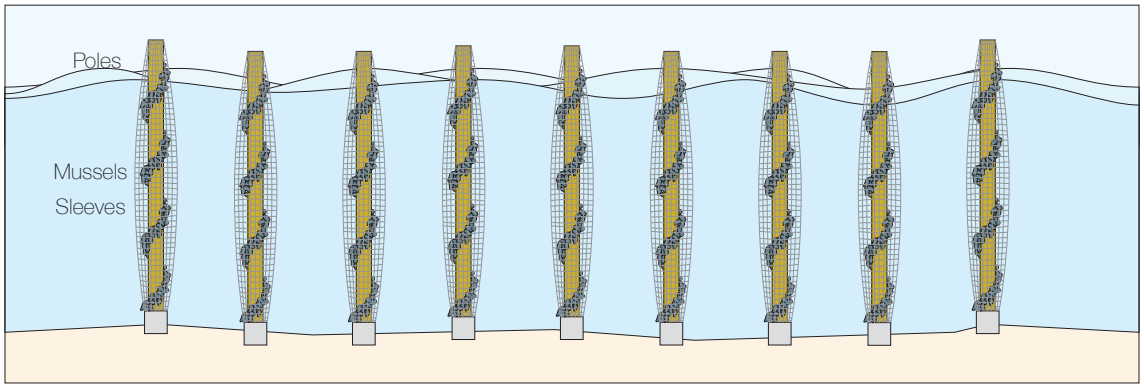
Mussel production can be conducted in several ways. But he approach executed at Dansk Skaldyrcenter could be entitled as mussels grown on line. Mussel production stands out according to other productions by being based solely on natural principles. Mussel larvae are captured from its natural habitat and then attached to a material provided. Line mussels are grown using long narrow nets called sleeves, hanging in the middle of the water mass. Here the mussels thrive on the nutrition in microscopically phytoplankton naturally found in the water. The only thing provided by the farmer is the material that facilitates the space in which the mussels are growing on, the sleeves. The farmer only stages the growing process. Consequently the farmer is vulnerable related to the production when he relies entirely on nature to produce the harvest.

The advantages by growing mussels in the middle of the water compared with the seabed are related to a minimum existence of the natural enemies of mussels, such as starfish. Likewise a greater amount of nutrition are present in the middle of the water, as well as the separation of feedstuff and sand. When the mussels have attached itself to the sleeves, the only task of the farmer is related to small maintenance and, by lowering the stockings from the buoys, securing through the cold temperatures in the winter. After 10-18 months, the mussels have grown to a satisfactory size and are ready to harvest (Mark Løkke 2013, interview, 23. August). A diagrammatic description of the constellation is shown below.



ill. 29: *Illustration showing mussel cultivation on lines*

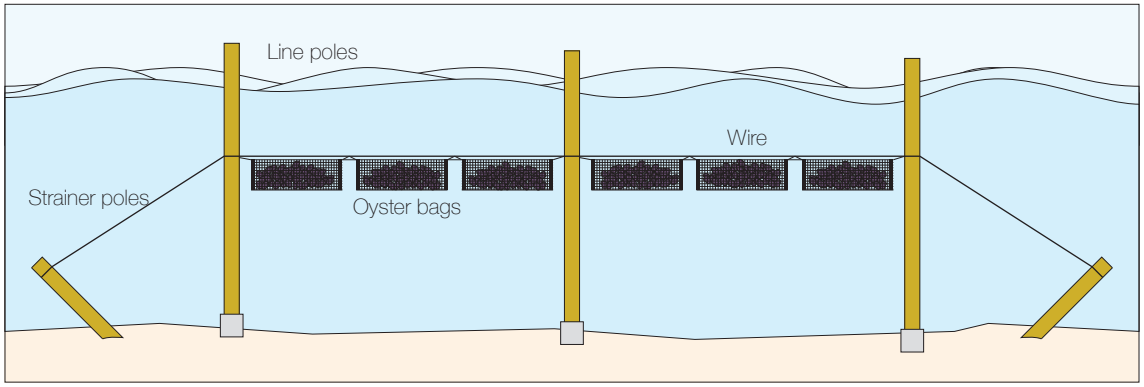
Throughout the world slightly different version of this approach of mussel cultivation appears. But they all approach the process in the same manner, the difference are in the technique they use for keeping the captured mussel fry. Some use baskets other use piles with clamped net that rot away so the mussels occasionally grow on the piles themselves (Dansk Skaldyrcenter 2013b). Another method is based on a raft structure where the mussels in stockings grows from the pole structure. Each production method has its own advantages and has different demands in the amount of time and attention they need from the farmer. The time required for growing the preferred size of mussels is related to the amount of mussel pr. m3 water. Only a certain amount of phytoplankton are present in the water (Stickney 2009, 93). Below is an illustration showing a constellation of a French method of cultivating mussels called 'Bouchot Mussels.'



ill. 30: *Illustration showing mussel growing on poles, inspired by the French method 'Bouchot Mussels'*

Oyster production is carried out in at least two different ways, either as intensive on land or semi intensive using the methods provided by nature. Intensive method is supposed to mimic the natural process in controlled facilities on land and the semi intensive relies on the nature with smaller interventions, more or less like the mussel production (Dansk Skaldyrcenter 2013b). In 'Dansk Skaldyrcenter' they prefer to use the semi-intensive method, but solutions natural methods exist around the world like the one previously explained about mussels.

Below is explained the setup for Oyster production inspired by Australian Oyster farmers. Two parallel lines are suspended between a series of wooden poles. In the gabs between the poles bags carrying the oyster larvae until they have grown into finished Oysters ready for harvest. The bags can be placed parallel or orthogonal on the lines (BST Oysters 2009). It is estimated that the Australian oyster farmer's method is adaptable due to the fact that the facility is supposed to mimic the natural proses, hence no necessity for human intervention. The facility only carries the oyster production, letting the water and the nutrition herein deal with the production. It would then be able to adapt to local conditions.



ill. 31: *Illustration showing oyster cultivation*

Beside oysters and mussels a wide range of shrimps, craps, lobsters, and seaweed is cultured in traditional aquaculture, and more than 200 different species, both animals and plants, have been identified in aquaculture production facilities worldwide (Stickney 2009, 9-12). Production methods in the open water all require some sort of containment like a cage, a net, or a bag, and they need to be floating on the water like rafts or barrel structures, or fixed to the bottom of the water or to on-land-structures with poles and wires. In these facilities the culturing follows the natural principle of growth until the product has sufficiently grown and ready for harvest (Stickney 2005, 86-97). Below is a picture of a floating salmon production facility from Chile, where the fish are kept in cages floating on the water.

One important thing to remember when starting up a cultivation practice in new waters, is that severe consequences could be related to introducing new species of seaweed and seafood to the natural ecosystem. To diminish consequences, production should rely on species found natural in the water, to avoid spending to much of an effort manipulating the environment into accepting the new product in its system.

ill. 32: *Example of another type of facility for culturing an aquaculture related product. Salmon farm in a Chilean fjord*

In a more sustainable note, related to water, a couple of years ago Professor Detlev Ipsen from Department of Planning Method and Empirical Planning Research at the Gesamthochschule in Kassel carried out a survey in Dresden and Frankfurt in Germany, asking people what they saw as the biggest environmental challenge. Respectively, only 7.6% and 3.3% mentioned water quality or shortage as an environmental problem (Ipsen 2005, 130). Fact is that Europe is not short on water supplies, the problem lies in the availability of quality water for drinking. Water is easy accessible, and the invisibility of water treatment, cause people in general to loose awareness of the risk of water shortage. This calls for a reaction if the negative trend has to be met and one approach could be to further facilitate water treatment to people in the urban sphere to heighten the awareness of the issue for people. Ipsen refers to this as a need for change in our water culture and encouraging to a social approach to a water treatment, supplying ordinary people as well as professional with the tools and knowledge needed for taking care of our water supplies. This approach needs to be addressed on a political level, as well as in the small scale, in the individual projects (Ipsen 2205, 131).

ill. 33: *Limforden and its adjacent industrial cityscape*

The demands for seafood is expected to rise in the following years, which contain great benefits in terms of enhancing food quality and health for people. Whilst growing seafood research have confirmed that aquaculture production has ecological potentials in terms of cleaning the water it inhabits and preventing oxygen depletion.

Production-wise several methodological approaches can be put forward and as the examples presented, not one method is the right way. When mimicking the natural process of seafood production, the key element is to control the space in which the seafood grows. During the chapter, examples of facilities designed as fixed or floating structures were shown

At the end Professor Ipsen from Germany provided information related to the awareness of water cleaning. If people in the future should care more about the water, a higher awareness of water treatment should be met.

The following sentence summarize the potentials of engaging in an aquaculture practice in an urban settlement

Urban Farming can provide society with urban functions and products relevant for sustainable-minded living in the city of the future

2.4 Urban farming investigations summary

Through these investigations the groundwork for an Urban Farming facility has been laid and how this should be approached in an Aalborg context with Limfjorden as the facilitator. A project should be developed through the vision of Aalborg as "The tough little big City" and with visions and ambitions rooted in Urban Farming and aquaculture potentials. Related to the previous examination of the subjects related to the functional part of the project, summed up in the green boxes, a few clues reveals itself to how an urban farming, and aquaculture, practice should be unfolded, which in the following will be composed in a few principles regarding urban farming, architecture, and the city.

Potentials occur when professional and private food production are merged in a coherent food system. A healthy food system where professional and private initiated food production could heighten the quality of both the quantity producing professionals and alternative production of the private.

The food system should be a symbiosis between private and professional food production

Urban Farming has the potential of becoming the next phenomenon that cause a paradigm shift in how we plan, design, and live in our cities. By Introducing Urban Farming to the city fabric, a clear vision needs to be incorporated in all scales of the architectural projects. Food production potentials occur when looking at the production system as a combination of rural and urban, but also looking at the system as cycle of waste within the city. The goal is to identify the potentials that the single project could add to the overall system and how others could nurture from the given project's waste.

Planners should treat the phenomenon of Urban Farming in all scales of city planning

Architectural tools and creativity contains the possibilities to further enhance the potentials of Urban Farming and integrate the qualities throughout the city. Architects have the knowledge and the tools to create coherences within the urban scheme. This knowledge needs to be applied in order for Urban Farming to be proper integrated in the city fabric.

Urban Farming should be included on equal terms in integrated city planing and architecture

Urban Farming can provide society with urban functions and products relevant for sustainable-minded living in the city of the future. Food production in the city should rely on local crops and techniques. Improvement in health and well-being is associated with the mere presence of Urban Farming and the products within the phenomenon. The health and sustainable potentials associated with eating local food must be explicitly explained to the population if it ever should be incorporated within the common human awareness. An efficient tool in this agenda is to manifest the idea within the physical world through architecture.

Architecture should express potentials of sustainable urban living, including urban farming

Urban Farming possess great potentials in staging social events and thus help to improve city life. Urban Farming grows out as a response to local conditions and should thus be used as a facilitator of local history and legacy.

Urban Farming should emanate from the local , cultural, and historical legacy

These principles is the final result of the functional investigation that covers the complete output of the last chapter. In the following, an architectural investigation concerning spatial creations will be unfolded. My own interest in the architectural field is greatly influenced by artistic approaches and I find great inspirations within art creations. I recognize great potential and inspiration in artistic thoughts, and thus my spatial investigations is greatly influenced by this belief.

ill. 34: *Functional summary*

3.0 Spatial investigations

The chapter concerning spatial investigations will take point of departure in the notion of Architectural space and relate the notions to architecture and the experience of urban aquaculture. From the investigations of architectural space investigations into water, and art related to how they serve as a mean for creating spatial experiences will conclude this chapter.

I recognize great potentials in looking to artistic approaches to spatial creations because I believe that architects can learn a great deal from spatial interpretations, spatial expressions, and understandings of space interpreted and expressed by artists. That is why the following spatial chapter will take its point of departure in the artistic perception of space originally unfolded by German art historians from the late nineteenth century, and from that look at different architectural approaches to creating space through the last century.

3.1 Architectural Space

Architectural space will in the following chapters be studied in a combination of historical theoretical writings and contemporary projects related to the design project at hand. Trying to answer the question related to the spatial part from the vision in the introduction: How architecture can help stimulate social life and create spaces that nurture local, cultural quality experiences, related to the harbour and the city of Aalborg

When creating architecture different factors needs to be considered. Different opinions needs to be met, budgets should be respected, planning and zoning regulations complied, etc. Important issues when creating architecture, but when a building is done and the users have taken over the spaces, the judgement of its quality never relies on its ability to fulfil these priliminary conditions. The final assessment of a building is in regards to how it makes the users feel by touching our senses and how it meets functional needs. The appreciation of architecture will always be subjective and based on individual experiences. I believe this is additionally what makes architecture interesting and fascinating. No two people alike have the same desire from architectural creations, nor do architecture represent the same for any individuals. And in addition to that, not two works of architecture can be compared across different functions, typologies and architectural styles. That make a discussion regarding quality in architecture quite difficult.

If a notion within architectural quality was to be defined that represented the same in the grandest cathedral and the smallest villa within its definition, that notion would contain something of uttermost architectural essential. Such a notion could heighten the level of discussion and change the focus from addressing individual incompatible architectural taste to treating architectural quality on a more universal level. A concept of notion that should assemble and assimilate all kinds of architecture across different typologies, diverse traditions, and the vast amount of historical architectural styles.

In the late nineteenth century, such a notion was sought out by several of the frontrunners within art theories. And the solution they defined was the theory of architectural space. When talking about space in architecture, and the quality of that space, the discussion is liberated from prejudices of style, typologies, and function. The discussion will then only address how architecture directly affects people and how architectural space make them feel. The notion relate to the atmosphere or mood of a space created by the build, and thus from what, as mentioned before, the building receives its final assessment. By accepting this, that architectural space is the essence of architectural creations, the architectural focus will be on how architects can treat the mind and body of humans through the means of space.

During the last century only a few other architectural subjects has been debated the same amount as the discussions regarding what is architectural space and how architectural space is perceived by humans (Mallgrave 1994, 1). After the unfolding of the notion architectural debates has evidently changed from concerning different styles and appearance of architecture, to focusing on different concepts of space (Vidler 1998, 104). But what defines the notion of architectural space? And why is it necessary for the architectural practice in the twenty-first century to study and understand? And even more interesting, how are we supposed to use the knowledge stored in this vast theoretical field?

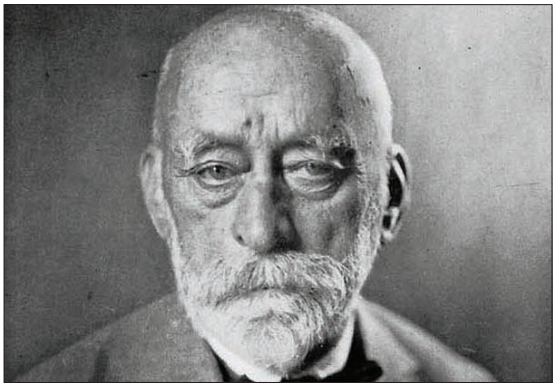
The initial spatial studies from the late nineteenth century span from a philosophical and physiological study of how we perceive and understand space, to a psychological question of how we appreciate and enjoy them (Mallgrave 1994, pp. 2). Since then the idea of space has been an important subject when discussing architecture and for architects themselves to describe their work. Space has come to be understood as equally important as structure when creating architectural compositions (Collins 1965, 287). Some architects have even gone so far as to specify the creation of spaces as the core of their architectural work.

The following three quotations indicate the influence the spatial theories have had on the contemporary and later practitioners of architecture and thus hint at the enormous influence the spatial theories have had on the last couple of centuries of architectural understanding.

The Dutch expressionistic architect Hendrik Petrus Berlage expressed in the beginning of the twentieth century:

"The aim of our creations, is the art of space, the essence of architecture"
Hendrik Petrus Berlage, 1908

He was an aspiring architect when the theories of architectural space was unfolded, and a student of Gottfried Semper. The above quote reveals the influence the spatial theories have had on him, and on his understanding of architecture (H.P.B 2014)



ill. 35: *Hendrik Petrus Berlage*

The German modernist and acquaintance of Berlage, Mies van der Rohe later expressed the following:

'Architecture is the will of an epoch, translated into space'
Ludwig Mies van der Rohe, 1934

This sum up one of the key point of the psychological approach to the spatial theories, and thus reveals the influence on one of the greatest architect of modernism. He explains architectural spaces as a physical container of information regarding humans and their commitments throughout history.

ill. 36: *Ludwig Mies van der Rohe*

The American architect and educator Louis Kahn have been famously quoted for saying the following:

'Architecture is the thoughtful making of spaces'
Louis Kahn, 1967

In comparison, Kahn represents a younger generation of architects from almost a century later than the unfolding of the spatial theories. But he still refers to space as somewhat the essence of architecture and by joining the making of space with the word thoughtful, he likewise indicates that space within its being can store human knowledge.

ill. 37: *Louis Kahn*

The three quotes briefly indicates the mayor influence the architectural space theories have had on architectural thinking. Later a short examination of how the physical world of architecture likewise have been effected by the theories through the last century.

Architectural space is the only concept that is common for all architectural works ever since man started building shelters to protect himself. But it was not until the mid nineteenth century that philosophers, architects, and art historians began to increase the determination to enrich the meaning of architectural space, unfold the notion, and introduce it into the history of architectural ideas. Before that, architects and theoreticians were mainly concerned with the structure, and space in its three-dimensional meaning was never discussed (Collins 1965, 285).

The space theories, unfolded itself in Germany by a number of great art historians during the late nineteenth century. Spatial theories were not the only, nor most important, concerns in each of their respectfully academic careers. Therefore, together with the misfortune of being primarily written and stored in the pre-Nazi Germany in a non-digital era, were many of the essays containing the knowledge lost in the wars or overlooked by the English speaking international audience in favour of more substantial works by the individual art historians (Mallgrave 1994, 2). But nonetheless, their pioneering theories on architectural space deserve a thorough perusal.

Today, my concern is that architectural space is being formed mainly by economical issues, and the issues that constituted the primary judgment explained in the space introduction. We as architects are advocates of spatial creations that favour human factors with respect to the later sensual judgment. Because of this spatial theories are as important today as they were hundred years ago, to help architects create buildings that is suited to human needs.

Harry Francis Mallgrave, an educator and professor in history and theory at the Illinois Institute of Technology, started his academic career with his dissertation about Gottfried Semper in 1983 (IIT, 2014). In 1994 he translated six original historical essays, which represents the core of spatial theories, and released them in a book: "Empathy, Form, and Space", comparing the different theoretical elaborations on spatial theories and putting them into context for the contemporary reader. In the following sections some of the different notions within these theories will be discussed, and Mallgrave's book and writings, will be used as main reference.

ill. 38: *Harry Francis Mallgrave*

Theoretical approach to Architectural Space

The founding philosophies needed to conceive the spatial theories occurred during the last half of the eighteenth century. Like many other themes in German philosophy these notions can be traced back to Immanuel Kant. It was him who established the foundation of a paradigm that could nurture a philosophical treatment of form and space. His notions 'pure form of intuition' and 'forms of thought' represents his idea of mental form construction by the observer. They represent a method in which we organize our perception of the surroundings (Mallgrave 1994, 5).

Immanuel Kant expressed space as 'a priori', meaning roughly already given. He meant that space was given from the beginning and there were no reason in trying to imagine a world without space. Later on, through Einsteins relativity theory and string theory, physics have cast some doubts in this preposition, but for everyday life, this could be understood as a fairly adequate definition (Davies 2011, 62). Kant provided the general philosophy that later specific architectural philosophies could build upon to develop the spatial theories.

The architect and professor Gottfried Semper expressed some of the most influential architectural theories from the following period of time (Zucker, 1951, 8). He provided the initial architectural thoughts based on the work of Kant. Semper worked with the notion of wall 'dressing' as one of the keystones in his four motive theory and claimed it to be the first example of a formal principle in architecture solely based on the concept of space and independent of structure (Mallgrave 2005, 196).

Afterwards innovative architectural theories started to emerge from other sources than from creative and academic architects. A new approach to discussing and understanding architecture as well as a tool to compare works across styles and time emerged from contemporary art historians. The central interest transferred from being of the relationship between form, function, material, and technique to how space, volume, and form could have aesthetic qualities in itself. The importance of this shift, and what is crucial to understand, was that, theoreticians shifted the architectural theoretical agenda away from discussing 'styles' toward something more fundamentally to architecture, the experience delivered by the architecture itself (Mallgrave 2005, 198).

To me it is quite interesting that the theories was developed by art historians instead of architects, because of my fascination in what the art disciplines and the artistic way of thinking can provide for an architectural project. Therefore will this investigation within spatial theories also address the artistic approach.

To understand the philosophical notion of space a more thorough investigation of the theoreticians and their respective theories will follow. The philosophy had different approaches, here focus will be on three of the most influential figures. They were chosen because of their significance on the psychological dimension of perception.

Their personal life will briefly be outlined to understand how they all influenced each other, how they were taught by the same teachers and found themselves in the same communities of academics, and to put them in a historic time frame. The difference in the theories hence occur in the way in which they describe the notions and in which way the angle their writings and what they had focus on.

The theories are 'Einfühlung' (Empathy) outlined by Robert Vischer after his Father Friedrich Theodor Vischers initial work, which influenced the theory of 'Psychologie der Architektur' (Architectural Psychology) conceived by Heinrich Wölfflin, and his academic opponent August Schmarsow with his theory of 'Raumgebilde' (Spatial Construct), the essence of architectural creation, the creatress of space.

Friedrich Theodor Vischer (1807 - 1887) & Robert Vischer (1847 - 1933): Einfühlung

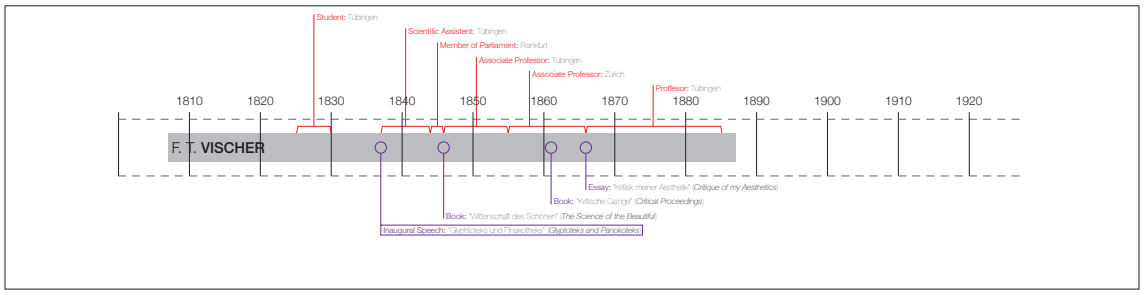
Friedrich Theodor Visher was a charismatic figure academic circles in nineteenth century Germany. He was a vital exponent of the newly established 'science of the beautiful' the aesthetics, a writer, and political activist. Friedrich was one of the more fascinating personalities of the nineteenth century, due to his exceptional character, that to some was quite offensive. His attitude towards the profession therefore caused him a two year suspension in his inaugural speech as the chair of aesthetics in Tübingen, due to his very sarcastic way of addressing certain subjects (Mallgrave 1994, 18).

ill. 39: *Frederich Theodor Vischer*

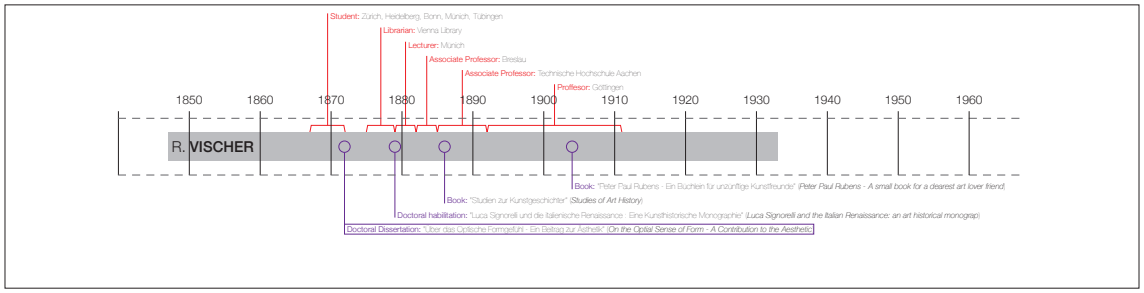
Friedrich had many travels to Italy in order to gain first hands experiences of the art and architecture like many of his contemporaries.. His academic career centred around the University in Tübingen and the Polytechnic University in Zürich, where he appeared in circles with Gottfried Semper and Jakob Burckhardt.

His son Robert Vischer, wa greatly influenced by his fathers many academic friends and frequent visitors, here among the academic and his godfather Eduard Mörike, the author Ludwig Uhland and theologian David F. Strauss (Sorensen 2010). It was therefore natural that Robert started an academic career. In his work, he occasionally compared, drew parallels, and also emerged his own studies from the writings of his father. He studied in Zürich, Heidelberg, Bonn, Münich and Tübingen, and he ended his studies with the Doctoral Dissertation 'Über das Optische Formgefühl - Ein Betrag zur Ästhetik' (On the Optical sense of Form - A Contribution to the Aesthetic) (Meyers 1905). This was the contribution that outlined his spatial theories.

After the end of his studies, he worked for several years as a librarian at the Vienna Library before starting his habitation script at the University of Münich. Here he functioned as a lecturer before moving to Breslau to fill a position as Associate Professor and later in 1885 as an Associate Professor in 'Die Technische Hochshule' in Aachen. In 1892 he was appointed the professorship at the University of Göttingen, where he remained the rest of his academic days until 1911. Below is a diagrammatic timeline illustration of each of the two historians academic careers with key positions as well as releases in terms of books, essays, speeches, and dissertations.



ill. 40: *Timeline of the academic career of Friedrich Theodor Vischer*



ill. 41: *Timeline of the academic career of Robert Vischer*

Theory of 'Einfühlung'

Friedrich Vischer were colleague and friend to Gottfried Semper and greatly influenced by his theories. He started to develop ideas about the psychological influence when talking about the interpretation of form, the human 'Ineins- und Zusammenfühlung' (unifying and contractive feeling). In terms of architecture as a cultural art he came to understand the emotional sense that we can read from it '*to express the whole outer and inner life of nations*' (Mallgrave 1994, 19). This point is close to the core from which Heinrich Wöllflin later would develop in his theories.

We as humans involuntarily read our own emotions into all objects that surrounds us. From the smallest organisms to the grandest landscapes we attach a feeling that we in some way relate to our own state of mind. This concept Friedrich called 'Formsymbolik' (The symbol of form) (Vischer 1873, 90).

Robert Vischer continued working with the psychological impact on perception in a wider context of theory with his doctoral dissertation, which he dubbed the notion of 'Einfühlung' (later translated to the English word empathy). In this context the notion of Empathy meaning more than the ability to feel sympathy and compassion towards the concerned object or person but refers to a more general process in which we gratify the object our vision and with life or with a soul (Bridge 2010).

Robert drew parallels to the symbolism of form defined by Karl Köstin, that form can remind us of another form. He argues that the mind is similarly reminded of something by seeing something similar. The mind tries to discover resemblances between external things and its own mental state, experiences, sensations; Vischer dubbed this 'Empfindungen', moods, emotions, and passions (Vischer 1873, 91).

Another influence on Roberts initial theories was the dream interpretation theories by Karl Albert Scherner. He describes how when dreaming the body responds to certain stimuli by objectifying itself in spatial forms. That it unconsciously projects its own body and soul into the form object. (Vischer 1873, 92).

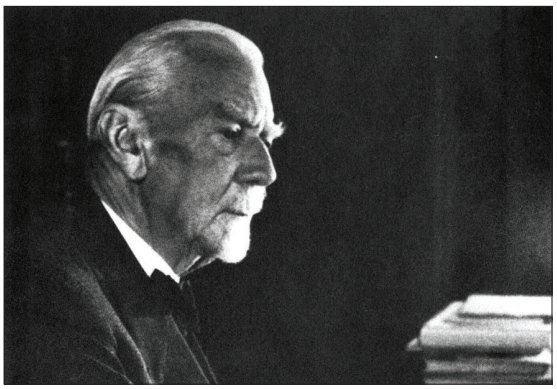
Last, his fascination with the latest research on human physiological investigations regarding sensation or perception and inspiration helped him conclude his theory. His works concerned the combination of these psychological and physiological insights into the subjective experience of art. (Mallgrave 2005, 199).

His theories defined art as being self referential, and architecture and its form therefore is a representation of our current and collective state of mind. The artistic responses we understand in the aesthetic of each objects is the collective psychological content that we ourselves project into the object. (Mallgrave 2005, 199).

The theory supplied from Vischer is treating sensual experiences in regards to art and everything that humans experience around them as an projection of our own psyche. Hence human psychology becomes a part of our perception of the world around us. The physical build world is experienced as pictures of our inner state, and represent ourselves in physical form.

Neither Robert or Friedrich Vischer did evolve this idea noticeably further in their respective academic career, but others made significant contributions based on the theories unfolded by them. They created the groundwork for others to continue, and hence empathy was the initial work of a psychological perception of space. Their predecessors are many, but amongst the most noticeable, and maybe most important in general in terms of space theories, was Heinrich Wölfflin, which in the following will be investigated.

Heinrich Wölfflin (1864 - 1945): Die Psychologie der Architektur



ill. 42: *Heinrich Wölfflin*

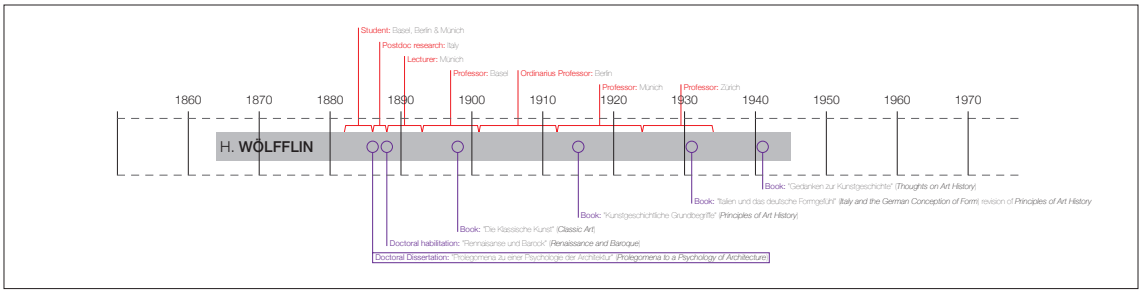
The late nineteenth century Art Historian and aesthetician Heinrich Wölfflin was born in 1864 Wintherthur Switzerland into a wealthy and culturally very educated family. His father Eduard Wölfflin was a professor in philology in Zürich and later in Münich. Eduard was active in paving the academic possibilities for his son, and his influence on his son's academic career is highly evident because Heinrich occasionally uses linguistic evidence to support his theories. (Sorensen 2013).

His core studies, were about Perception and analysis of formal aesthetic and methodology. With his studies he wished to establish a set of principles to classify an objective art history, based on the shared psychological state of mind and understanding of the world of a given period (Liukkonen 2013).

His philosophical studies started in Basel under the German Professor of Philosophy Johannes Volkelt and Cultural Historian Jakob Burckhardt, which was the inspirational figures that sparked Wölfflin's enthusiasm for studying Art History (Sorensen 2013). His academic training led him to universities in Basel, Berlin and Münich, studying under great minds such as Wilhelm Dilthey and Heinrich Bruun. In 1886 in Münich he wrote his doctoral dissertation 'Prolegomena zu einer Psychologie der Architektur' (Prolegomena to a Psychology of Architecture). This was his initial writings of his psychological theories in art, and which remained the core of his studies throughout his career. His theories were in his own words influenced by Johannes Volkelt writings on the history of the term symbol (Wölfflin 1886, 153), but his mentor Wilhelm Diltheys 'Geisteswissenschaften' (Human Sciences), as well as Jakob Burkherdt's wide understanding of the correct academic construction of historical documents was likewise obvious sources of influence (Sorensen 2013).

The years after his dissertation he spent in Italy, researching and writing for his Postdoctoral. These years culminated in the Rehabilitation writing 'Renaissance und Barock' from 1888, which became his first book release (Sorensen 2013). In this book Wölfflin made a clear distinction between the two art periods, and thereby for the first time outside Germany defining the Baroque period with respectable phrasings (Liukkonen 2013). Afterwards he worked as a lecturer at Basel University and later awarded with a professorship in 1893 succeeding his old mentor Jakob Burckhardt. Later in 1901 in Berlin he was appointed the very prestigious position as Ordinarius Professor. In 1912 Wölfflin returned to Münich to succeed Berthold Riehl. As many other non-Germans Wölfflin were affected by the increasing Nationalism in Germany, which led him to move to Zürich in 1924 and accept a position at the university, where he stayed the rest of his academic life. (Sorensen 2013).

During his long career, Wölfflin released many popular books on analysing works of art and art itself and he supervised many dissertations by students who later became great academics themselves. It is therefore not an underestimation to name him one of the greatest influences on art history during the nineteenth and twentieth century. (Sorensen 2013). Below is an illustration showing the key points chronological on a timeline in terms of academic positions and noteworthy writings from his academic career.



ill. 43: *Timeline of the academic career of Heinrich Wölfflin*

Theory of 'Die Psychologie der Architektur'

Heinrich Wölfflin was by contemporaries considered one of the greatest living art historians (Sorensen 2013). To him 'style' was a visual expression of 'Lebensgefühl' (Feeling of life) of an epoch. The theories emerged from the investigation of psychological and physiological formal response by Robert Vischer explained above.

He opens his dissertation 'Prolegomena zu einer Psychologie der Architektur' (Prolegomena to the Psychology of Architecture) with the question: 'How is it possible that architectural forms are able to express an emotion or a mood?'. He understood that both the ordinary man and the art historian didn't hesitate to name a work of architecture by a mood, but he wanted to understand how and on what basis we make these verdicts (Wölfflin 1886, 149). 'The psychology of architecture' wanted to describe and explain the emotional reactions that art is able to evoke with the means proper to it (Wölfflin 1886, 150). He proclaims that aesthetic only had to do with the visual appearance of an object and how that was perceived. Beauty is directly connected with how pleasing the object is to the eye (Wölfflin 1886, 150). But the eye responds indifferently to forms, it only reacts to the intensity in light. Therefore another way of explaining the reaction to form is needed. His understanding of the solution lays in the now famous quote that

> *"Physical forms posses a character only because we ourselves possess a body"*
> (Wölfflin 1886, 151).

The sum and diversity of experiences we have through our life with our own body in the world, defines how we understand the expressions we receive from the world. Wölfflin saw the psychological reactions triggered by the art itself as the crucial matter of understanding how architectural space is perceived (Zucker, 1951, 9). Everything we experience we compare to our own physiology and psychology, and can only understand what we ourselves are able to express. We understand a meaning from form only because we through them imagine the expression of a sentient soul (Wölfflin 1886, 152).

Wölfflin explains that the mood and the expression we receive from form is nothing but our own vital feelings. We project the image of ourselves into all objects and human beings around us and our intuition is to expect that these objects contain the same conditions that define our own comfort. We perceive the world around us through the conditions we have in common. Hence the reversed understanding as well, that an object '*can only communicate to us what we ourselves use their quality to express*' (Wölfflin 1886, 152).

In order to understand the mood that form implement in our perception, Wölfflin talks about theories of how the comprehension of human expression is mediated by a sympathetic response. He argues that every mood has a clear expression that follows it. He calls it the 'physical manifestation of the mental process,' a process which is evident throughout all of our body. Whenever these expressions occur, one will immediately begin to feel the mood accompanying the expression. According to Wölfflin we can empathize with other person's expression, thereby transferring a mood or emotion from one human to another through the expression received by the later from the former (Wölfflin 1886, 155-165). This reaction occur unconsciously and is a response to external stimulus. To be able to experience these responses, it is necessary to forget oneself, loose the self-awareness and sympathize with the source of the stimulus expression. 'Our own bodily organization is the form through which we apprehend everything physical.' This is the conclusion Wölfflin derives from his psychological analysis. (Wölfflin 1886, 157-158)

He ends up discussing whether this expression is valid on individual occurrences or more a case for describing the collective psychology of a whole culture or period of time. These theories opened up a whole field of investigations in art history in regards to describing the collective psychological state of mind through the sense of form for a certain historical time or style. In his theory art prevails the attitude of a certain art period through its unique artistic style (Mallgrave 2005, 199). During his long academic career, he wanted to create a framework for integrating empirical, psychological and visual elements. He understood art as a visual language, a container of knowledge (Sorensen 2013).

I understand Wölfflin's theories as the most adequate and precise treatment of the notion, and hence the most usable when working within the field of architectural space theories. When that is said, an academic opponent to Wölfflin in regards of spatial theories that I feel needs to be elaborated in order to examine the spatial theories, is August Schmarsow. In the following his approach to architectural space will be explained.

August Schmarsow (1853 - 1936): Raumgebilde

The German Art history theorist and scholar of Northern European and renaissance Architecture August Schmarsow was born in 1853 in Schildfeld a city not far from the city of Hamburg.

ill. 44: *August Schmarsow*

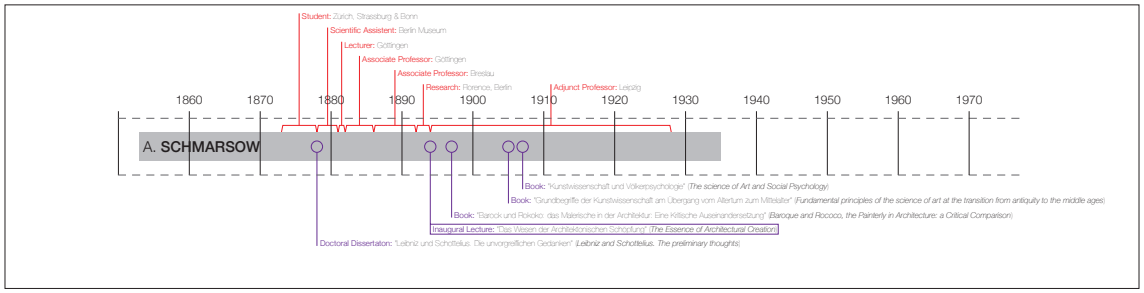
Before he started his studies, he wanted to attend the University of Basel to study under Jakob Burckhardt, but he instead started studying art history and philosophy in Zürich particularly under the influence of Johann Rudolf Rahn. During his studies Ernst Laas likewise taught him positivist philosophy in Strasbourg and art history by Carl Justi in Bonn (Neue Deutsche Biographie 2007).

After his doctoral dissertation he worked as Scientific Assistant at the Berlin Museum before he entered the academic world as a Scientific Assistant at Göttingen University and after a year he received a position as Associate Professor. In 1885 he were appointed Associate Professor at Breslau University where he also was chosen as Director of the University Museum (Neue Deutsche Biographie 2007).

In 1893 he succeeded Anton Springer as the prestigious Chair of Art History at the University of Leipzig, beating the before mentioned academic opponent and fellow art historian Heinrich Wölfflin for the position. In his inaugural speech Schmarsow sought at defining architecture solely as a spatial art thereby opposing his view against Wöllflins more 'formal' approach (Mallgrave 2005, 198). Though, later at Leipzig University, he started to implement a few of Wölfflins ideas about space in his theories, as well as his anthropological theories of his colleague the psychologist Wilhelm Wundt. (Sorensen 2012). Nevertheless this lecture changed the view of how architectural works were perceived. And several of his theoretical followers emerged from this significant historical speech (Neue Deutsche Biographie 2007). The following review of his theories will be based on this historical speech.

In 1897 he released his famous book 'Barock und Rokoko: das Malerische in der Architektur: eine kritische Auseinandersetzung' (Baroque and Rococo, the Painterly in Architecture: a Critical Comparison). Herein Schmarsow definitively implemented his theories of spatial interpretation. This book also followed some initial tendencies among fellow art historians, like Heinrich Wolfflin mentioned before, to treat the architecture of the baroque era, which formerly were neglected and denied as a worthy period of the arts (Sorensen 2012).

In his 1905 book 'Grundbegriffe der Kunstwissenschaft am Übergang vom Altertum zum Mittelalter' (Fundamental principles of the science of art at the transition from antiquity to the middle ages) Schmarsow followed the notion that impression of space is a part of the common psychological expression of a given historical period (Sorensen 2012). He understood space as a medium where psychological state of mind was explicitly expressed. His main academical achievements are summarized in the following timeline.



ill. 45: *Timeline of the academic career of August Schmarsow*

Theory of 'Raumgebilde'

August Schmarsow was a mayor contributor to the developing of art history as an independent discipline of science with its own theoretical foundation, methods and objectives (Neue Deutsche Biographie 2007). He was very innovative in his profession and the first to fully consider space as an independent architectural element (Sorensen 2012). This point is still crucial when todays undergraduate students of architecture all over the world attends workshops teaching the principle of form in relation to negative and positive spaces.

His approach to the notion considers the psychological sides of an artistic experience, how we perceive and interpret works of art (Mallgrave 2005, 198). He saw space as the active creation of human 'Köpergefühle' (Feelings and conscious awareness of he body) as a reaction of physique of the man, based predominantly on physiological laws of human nature, projected into the outer world (Zucker, 1951, 9).

Schmarsow was heavily influenced by Gottfried Sempers work, but he was likewise affected by perceptual psychologies of Herman Lotze and Wilhelm Wundt as well as the phenomenology of Carl Stumpft (Mallgrave 2005, 194).

Schmarsow starts his inaugural speech in Leipzig by criticizing the term unfolded by Gottfried Semper almost a half century earlier, that architecture is the 'art of dressing' for the superficiality in which it places architecture, and he follows by asking if it weren't the time to investigate the innermost essence of architectural creations (Schmarsow 1893, 282). A daring move to criticize such an influential character, but from this he derives his theories.

Schmarsow believed that the science of the arts needs to come up with its own methodology instead of accepting the approach already applied in the natural sciences. He therefore proposes to look at art 'von innen nach aussen' (from within), and he proposes architecture to be the starting point since for so long that has been externalized by an aesthetic 'from without' (Schmarsow 1893, pp 283). Even though this wasn't the most important part of his theory, it was still the most influential and this has ended up being the mantra for several later generations of architects, (Zucker 1951, 9). This has shown to be an important view in architectural creation, and like the point of negative space explained in the beginning, this point is still taught to students of architecture , and have been for more than a century.

Schmarsow were looking for a common denominator between every build structure in the world. He wanted to name a single notion, which could establish coherence between the noblest and the most hideous of buildings. To him, that notion must be the essence of architecture. He argues without exception that every prior architectural work is 'Raumgebilde' (Spatial construct) regardless of their 'style', material, or construction; the one essential feature is that they all enclose space (Schmarsow 1893, 286).

By following that notion, we understand that architectural elements like walls, columns, and roofs, becomes secondary elements to the architectural aesthetics. They become means to the overall aesthetic appreciation embracing that, which is truly essential to architecture, the space itself. But how is form perceived, he asks. To him it is represented by the notion of 'Anschaunungsform' (Intuited form). Our sense of space, the intuited space, is according to Schmarsow defined through our experiences first and foremost through sight, but also other physiological factors. All these perceptions are orderly unfolded in symbioses with this intuited form. His thesis then becomes, that architectural creation is based on this core (Schmarsow 1893, 286). Our 'Raumgefühl' (sense of space) and 'Raumphantasie' (spatial imagination) press towards 'Raumgestaltung' (spatial creation); they seek their satisfaction in art. We call this art architecture, in plain words, 'Raumgestalterin' (the 'creatress' of space) (Schmarsow 1893, pp. 287).

By saying this, Schmarsow assimilates the notion spatial creation to a primordial instinct in the human nature, an instinct to define existence and presence in the world through physical manifestations of space and form. (Mallgrave 2005, 198). He compares the action of creating space with our own need to express our inner feelings and state of being to the world. And the artistic interpretation of this need, is to him, architecture.

Summary

It is difficult to compare the three different theories on architectural space presented in the former, as they all more or less discuss the same notion. The difference occur in the way they describe and how they argue and verify their respective thoughts and in which area of the theory they emphasize.

I understand the theory of 'Einfühlung' as the groundwork of the notion and the later additions as building upon the base that were laid by father and son Friedrich and Robert Vischer. They presented the idea that the atmosphere or mood of a space is an expression of our common psyche and state of mind. This mood is the reading of own ability to feel empathy with objects and spaces outside of our own body.

Wöllflin theoretical writing is derived more or less directly from this, and he elaborate several areas of the original writings. He began to see the history of architectural space as a history of the human psyche and space as a physical container of the human state of mind. He furthermore develops the understanding of how and what an individual is able to perceive. We can only understand what we ourself can communicate and thus is the psychological aspect of our perception crucial in terms of how we read and understand the atmosphere or mood of a given space.

Schmarsow is addressing spatial creation more from the point of creation. He is writing about how we create space and why the space is a result of our understanding of the world and of our psychological state of mind. Space is the result of our sense of space and our imagination of space, both affected by the spatial experiences we collect through our life. He argues that we as humans have an inner urge to express our inner self, our state of mind to the world, and the artistic way of achieving this is occurring in architectural creations.

Summed up, the theoretical space that the art historians are dealing with is a space that is a result of our own common state of mind. The mood we can read out of a spatial creation is the response of our own body relating to the spirit of time in which the given space was developed.

Based on all this theoretical knowledge, and influenced by the different theories, the following sentence represents my position to the philosophical approach to architectural space:

The atmosphere of a space can be considered as the physical manifestation of the contemporary collected psychological sense of being and understanding.

But which kind of spaces is it then we as architects create? Architectural space is a facilitator; it stages a certain event, a happening related to the function it embraces. But there is a distinction in what these different functions demands from the space it consumes. In order to develop architectural space to more than a theoretical discussion, we need to add another layer concerning how we relate the atmosphere to the functional use of the space. In the following chapter, different approaches to the creation of space related to its functions will be explained.

Functional approach to Architectural Space

In a contemporary context how can looking back at these abstract notions about architectural space understood by the German art historians presented above generate useful knowledge that is relevant for architectural theories and architectural practice today? The theories contain something essential to architecture, which should not, and as the quotes in the beginning of the spatial chapter indicates, is not forgotten. Architecture is primarily about space, in my opinion.

Architectural style, form, and taste should be understood as the expressive culmination of the individual architect and not the main attention of our architectural judgement. Theories of architectural space is still relevant for contemporary architects and architectural students in an era where formal expressions and abstract styles thrives among architectural practitioners, and architecture is presented through endless amounts of magazines, internet blogs, and websites with exterior moneyshot renderings. It is important to remember that spatial experiences relates directly to human well-being, and thus creates the connection between architecture and people. This verifies the significance of spatial theories today and always.

Several approaches to spatial design unfolded itself during the twentieth century, and the architectural agenda during the last century has been defined by these approaches (Vidler 1998, 104). Modernism dictated that the function of a space, in the sense of human activity, could be precisely defined and hence the building should be designed from this definition. A thorough analysis of the functional use of a building would produce completely new spaces and thus new kinds of architecture, not affected by historical predecessors and contemporary prejudices. Thus the now famous quote:

'Form Follows Function'
(Sullivan 1896, 408)

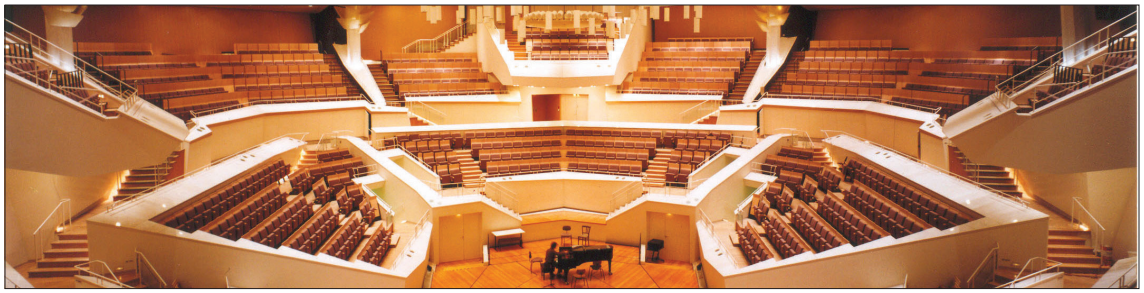
In the following, a couple of the different spatial approaches spanning over several decades from the twentieth century would be elaborated through examples, all of them in one way or another related to the quote above.

ill. 46: *The interior/exterior spaces of the Barcelona Pavilion by Mies van der Rohe*

New inventions and discoveries within structural systems created the foundation for new spatial experiences. The twentieth century modernists often tried to abolish the distinction between interior and exterior spaces and replace it with new kind of space that was neither inside nor outside. The Barcelona Pavilion by Mies van der Rohe from 1929 is often used to describe the modernists general approach to space (Davies 2011, 69). The pavilion spaces is defined by thin planes of glass and polished stone, without any windows or doors to seal one space from the other. The structural system of pillars and plates likewise made it possible to explore completely new spatial organisations, due to the decreased need for load bearing walls.

The spaces seems to float in and out of each other never being solely interior or exterior space. The spaces is experienced as free and open and as one coherent void and spatial distinctions are experienced through other means than physical boundaries. Change in light, materials, colours, form, or many other methods. Consequently the connection between function and space was not experienced as a unity but separated, due to the intertwining spaces. The function is therefore to some extent also experienced intertwined and completely new relations between functions and spaces were made possible.

It has been argued that The Barcelona Pavilion grew out of the spatial theories proposed by the old art historians. The way he defined spaces with thin structural planes was ground breaking and to this day is still applied to project in different ways (Collins 1965, 287).

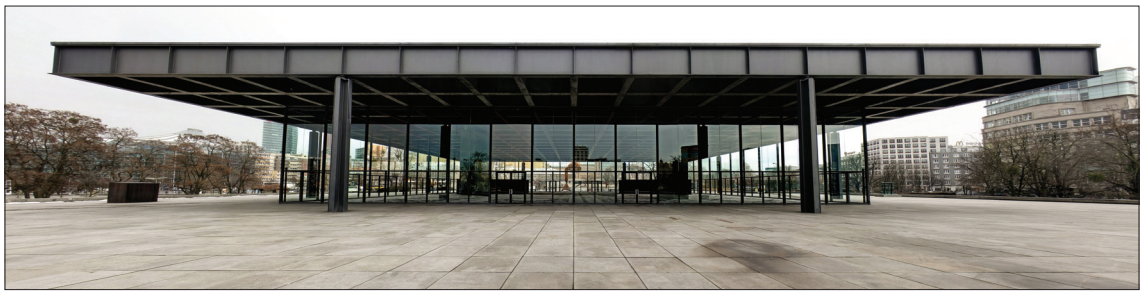


ill. 47: *The sub-auditoria in the Berliner Philharmonie by Hans Schauron from 1963*

A spatial principle often proposed is very explicitly shown when looking at the ingenious circulation system of the foyer in the Berliner Philharmonie by Hans Schauron completed in 1963. The spaces almost slide into each other entirely in accordance to a linear narrative of the human use of a concert hall. From the entrance the guests are led directly to the coat-hanging chambers, hence to small intimate spaces for small chats and meetings between the guests before the show. After locating the seat in the great concert hall the audience find themselves in one of many small uniquely angled sub-auditoria, which is evident in the picture above. The purpose of this division of seating is to create an intimate concert experience together with a few acquaintances instead of an anonymous experience in the middle of a huge metropolitan crowd (Davies 2011, 69)

The spaces responds to both human use and psychological experience of the functional use of the space, thus creating a consistent symbiosis between function and space. The spaces will exclusively fit an evening at a great concert experience and thus the architecture will have severe difficulties of adjusting itself to another use of the space.

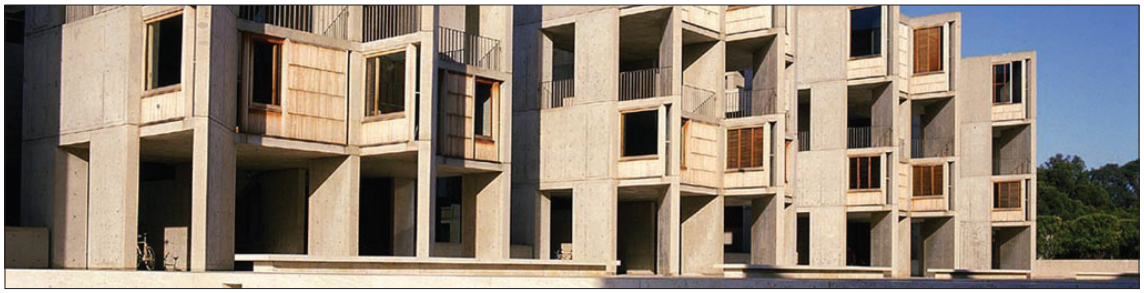
The psychological approach to the definition of space in the Philharmonie relates to the Psychological theories on the experience of space that Heinrich Wölfflin put forward almost a century before.



ill. 48: *The open undefined space unfolded in Neue Nationalgallerie by Mies van der Rohe from 1968*

Not many hundred meters from the Philharmonie in Berlin, is the Neue Nationalgallerie located. This museum is also designed by Mies van der Rohe and represent a completely different approach to spatial design, even though it was build within few years to the Philharmonie. Spatial demands are of course different from a museum to a concert hall, but the underlying concept of the relationship between functions and space vary significantly. Neue Nationalgallerie constitutes very few means in terms of spatial organisations. As the picture above shows, the building consists structurally of an enormous roof, eight huge exterior load bearing steel columns holding the roof, four glass walls defining the vague boundary between interior and exterior, and for structural stability two elevator shafts within the enormous empty interior space (Davies 2011, 75).

The space function as the entrance of the building and holds temporary exhibition. The architecture has significantly less impact on the spatial experience than the architecture in the Philharmonie. The principle for the space could be categorized as being functional flexible and loosely defined (Davies 2011, 76). In this way the space and the function seems completely separated because the function within this space could be changed without any impact on the architecture. Hence making the space be experienced exactly the way in which the artist prefer to his exhibition, related to Schmarsow's theories of 'Raumgebilde' for facilitating the contemporary development of the new art form Installation Art, which will be elaborated on later.



ill. 49: *Salk Institute studies, by Louis Kahn from 1962*

The American architect Louis Kahns approach to spatial design began with his act of grouping functions together in two groups: 'Servant- and Served spaces'. Briefly this is translated into spaces that facilitate social activities, such as lecture halls, offices, exhibition, or performances, and spaces that serve social activities as hallways, stairs, toilets, and so on, in order to make the served spaces work.

Kahn saw functions not as practical arrangements, but as primordial social institutions rooted in culture from which he could derive spatial needs. He recognized every social happening as re-enacting of an ancient human ritual with associated spatial traditions as the starting point in his spatial designs. The spaces was thus created according social archetypes that represent a basic human activity (Davies 2011, 79).

This spatial understanding is abstract and thus not easily displayable in his projects, but the underlying principle is comprehensible. To Kahn it was essential to understand the initial spatial demands related to these ancient social activities in order to interpret them in contemporary architecture.

Above is the studies from Salk Institute from 1966. The brief from the client Jonas Salk was that the project should invite Picasso to the laboratory. His intention was to introduce something unmeasurable to the very measurable institution of the laboratory in order to spark some creativity (Lobell, 1979, 76).

The example will focus on the studies because they quite clear exemplifies his spatial thoughts inspired by psychology. This could be the answer Kahn provided for Jonas Salk's wish to implement something unmeasurable, something non-scientific. The act of studying, to immerse into an activity alone, is according to Kahn a spatial archetype, which demands solitude and privacy. The dorms in Salk Institute are angled with view towards the water, but not towards each other. The light intake is moderate and the height of the rooms are a little less than usual. To Kahn these features promotes solitude and privacy and thus makes the space response to the primordial needs. Spaces for Kahn is related to the psychological demands related to the use of these archetype spaces.

The spatial approach and ideas in the Salk institute sparked the movement that later became the Academy of Neuroscience for Architecture which has the mission of promoting knowledge of neuroscientifical activities in response to the built environment (ANFA, 2014). Neuroscientifical scannings can reveal the activties in the brain generated by spatial stimuli, and mapping more exact how the body and mind reacts to different kinds of spaces. It is a research field in rapid development with enormous potential, and is believed to generate crucial empirical data of spatial impact on the human mind for the use of the future architects.

Summary

In the last century the architectural agenda has been defined by different approaches to the practical creation of space. Styles and construction has somewhat been secondary in relation to innovation in architectural spatial experiences. Perhaps the most influential change has been the principle of overlapping spaces. Spaces that float in and out of each other, spaces with no exactly defined physical boundaries. This approach has been acknowledged as the fundamental approach to a modern spatial creations.

Within this change a few approaches to the programming of space appeared. They all related to the function of that space, but they addressed the issue from different angles. At one end, the space could be defined exactly to the narrative of the function within the space, telling the story of how the space should be used. And the other end, the space could be left completely blank, constructed as an open box adaptable to severe changes within the space.

Tendencies against the space-follows-function attitude started in the middle of the century. The function of a space cannot be precisely defined and followers of Louis Kahn started to cluster spaces in two groups, the servant and served spaces. Kahn also started to look at the ancient archetype of the function, and from there defined the psychological demand to a given space.

Latest has the field of Neuroscience paved the way for a completely new approach to spatial creation. By examining how the brain response to spatial stimuli, a whole new world of knowledge can be opened up for architectural creations.

I believe, that a given architectural space always will first and foremost be experienced and judged according to its function and how well the space facilitate and promote this use. But I also believe that a function and the spatial demands related to a specific function evolves over time, and hence cannot be treated statically. Spatial creation should take into account both the spatial experience and the functional use.

Below is my stand point in regards to a practical approach to architectural space, influenced by the aforementioned approaches, summed up in a sentence:

Space cannot be treated only for functional use or sensual experience,
but needs to be developed through both

In the following section an analysis of two different spatial creations will be undertaken. The method of analysis will be based on the previous chapters regarding the theoretical approach and the practical approach to architectural space. The cases are chosen in regards to their comparability to the design project at hand and should likewise serve as inspiration.

Method for a Spatial Analysis

Space is the void that can be filled with everything we know, gas, fluid, or solid mass. Most of us will describe it as an infinite void, a vacuum (Davies 2011, 62). But what have infinite void, the universal space, to do with spaces in architecture? Spaces defined by architecture could be considered as a tiny space in the universal space. Through architecture we can assign qualities to these spaces in terms of enclosure, direction, orientation, scale, and so on. These qualities are experienced like the art historians said, through our body, senses, and mind.

Space might encourage a certain way of reacting. Maybe there is a luring spot with a greater view in one place, maybe the room is opening up or closing down in one end, or maybe the room has a centre in which everything is pointed at or pointed away from. All these gestures is experienced through the mind and the body of the spectator and provide the space with a formal character in which the designer is able to control and manipulate.

In order to fully understand the tool of spatial qualities in architecture, the theories would need to be put into context of actual architecture. Thereby linking theoretical notions with the physical practice. In order to do so, an investigation into two separate and different projects will be carried out. To make sure these case studies will be relevant for the overall project, the case studies were picked according to their functional resemblance with the project from the design part.

In the following section I will undergo a spatial analysis based on the notions explained in the theoretical and practical part of architectural space. The aim of this analysis is to clarify how other architects have dealt with the challenge of creating architectural space and what they have used to reason their choices.

The analysis will look at the spatial creations both in relation to defining a mood or atmosphere within the space, but also how the spatial creation relate itself to the functional use of the space. The question the following analysis is trying to answer is:

'How does the functional use relate to the spatial atmosphere of this space?
And by which means have the spatial atmosphere sought created?'

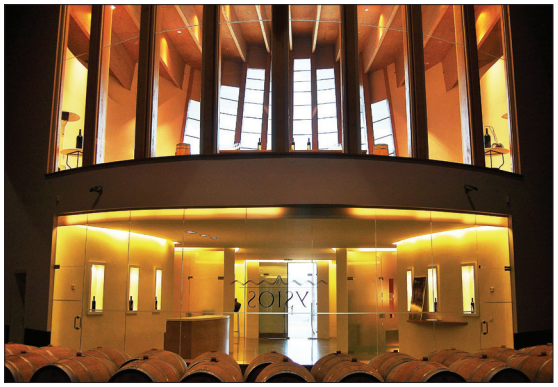
Santiago Calatrava - Ysios Bodegas

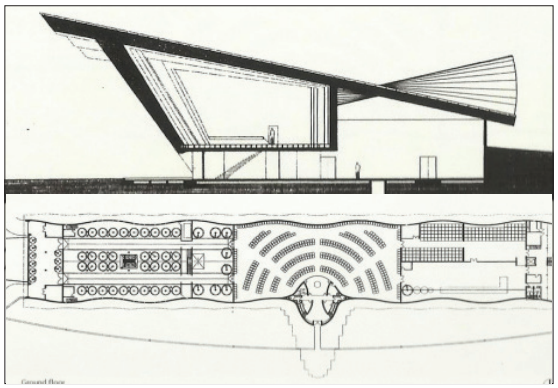
ill. 50: *Ysios Bodegas seen from the entrance*

The first is a case study is of the vineyard Ysios in La Rioja Alavesa in the Northern Spain by the famous architect and engineer Santiago Calatrava. During the last couple of decades architects have been challenged with the opportunity to rethink wineries as a contemporary expression of tradition, innovation, agriculture and technology, production and hospitality (Webb 2005, pp. 6).

The resemblance in creating architecture for a certain product in the food sector is the reason for this study. The architecture is facilitating the process of making fine wine. An honouring of the grape.

Ysios is the Egyptian god of wine. It is a fairly new vineyard, build between 2000-2002, placed in the traditional wine making country of Spain. The architect Santiago Calatrava is known for his combination of a sense of expressive artistry as well as ingenuity and courage in structural design. (Webb 2005, pp. 10). The analysis will focus on the space on the first floor in the visit centre, namely the room containing wine tasting facilities and the observation deck with a very delicately orchestrated view over the wine barrels.





ill. 51-55: *The restaurant space in the Ysios Bodegas by Santiago Calatrava*

A sinus curved building, both in plan and elevation occupies the rectangular building plot. This form of the building is very strict geometrically, but at the same time a smooth organic reference to the backdrop, the picturesque landscape with the grey Cantabrian crags. The building stands as an unique object, but at the same time blends in with the natural surroundings, which corresponds to the request by the owner, to create an inconspicuous icon (Stanwick & Fowlow 2010, pp. 42). His mission was to construct a unique, avant-garde winery, conceived as a place of worship, a place exclusively dedicated to the creation of wines boasting nothing less than the highest quality, with the decisive guidance of expert oenologists (Ysios Bodegas 2012).

The iconic roof structure is created by a series of curved aluminium covered beams of fir that mimics the mountains in background. The curvature in the façade, creating both increased structural strength and reflecting the colours from the area as well as creating the visual illusion of wine barrels standing in the landscape, is made from plastered cedar planks.

The interior follows the shape of the exterior sinus shape, following the wine making process linearly from the west of the building to the east. A four-year process, where the wine is stored in different types of barrels during different fermentation processes. At the end in the east, a storage chamber, holding up to 1.500.000 bottles of wines, is located (Ysios Bodegas 2012).

In the middle of the building, behind the main entrance, the visit centre is placed with an upper level overlooking a part of the cellar containing a carefully orchestrated collection of large wooden barrels where the wine is aging, placed in a circular shape with the observation space in the centre. The visitor centre itself is the culmination of the building shape, a dramatic room, almost majestically overlooking the vineyards in front of the building, and opposite the barrels in the interior storage space.

The functional use of this space is related to the winetasting experience and a showcase wine produced in this facility. This room is the throne of the building, the cockpit, the stronghold overlooking and observing both the growing of the grapes and aging of the wine, but at the same time distancing the viewer by lifting him from the ground, framing only what the winemaker wants to be seen.

The circular space is an elevated grand stand for spectators, a carefully orchestrated identity for the vineyard. The space is meant to impress and to present the farmer and his product in the best possible way. The space is meant to create an atmosphere that comforts the spectator and stages the wine making process in a protective and appealing manner.

The room in itself is quite neutral with bright colours, spot lighting, and a high ceiling. This builds up a loose atmosphere encouraging to social interactions and informal tone between participants. The mood is relaxed, and because of the distancing, not disturbed by the picturesque nature of the wine fields outside and the sculptural placing of the barrels in the room next door. But the room still has two areas related to the two different views. In the one side, the skewed windows creates a dramatic effect towards the wine fields, a projection of the untamed nature. In contrast to opposite side where the tall windows and the dimmed lighting from the wine barrels almost mimics a cave with barrels placed in hibernation, representing a tamed nature.

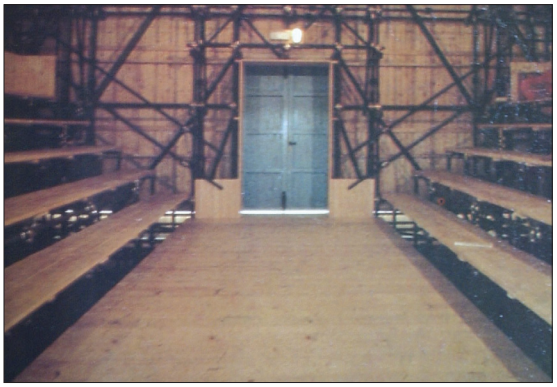
Compared to the theoretical spaces from the beginning of this chapter, this space can be an example of spatial creation that plays on the primordial instinct of defining existence and presence in the world through physical manifestation. This space represents the way the farmer, through the architect, defines himself and express his inner feelings and being in the world: The process of taming nature and creating a unique and tasteful product of wine. At the same time this space can be seen as a spatial culmination of the will of the era of internet and social media. We live in a time with a severe amount of self exposure and self presentation, and this space can be seen as the architectural equivalent to this. The space has a clear distinction of what to see and what not to see, and even the visible is staged exactly as the farmer intended. The space can be experienced as an optimized, polished resume of the farmer.

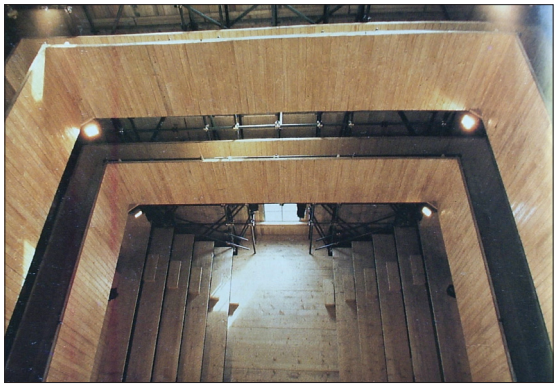
Aldo Rossie - The Theatre of the World

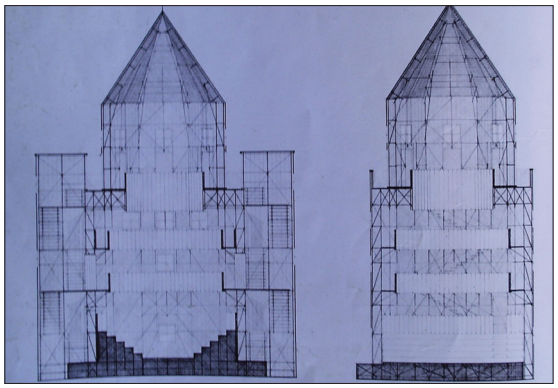
ill. 56: *Theatre of the World by Aldo Rossi*

The second case is a study of the very unique theatre constructed for the Venice Biennale in 1979 by Aldo Rossi. The theatre was a reconstruction of the historic floating theatres sailing the laguna in Venice in the 18th century. The theatre was constructed in one place and dragged by tugboat to its performing location during the Biennale, and when the shows were over, the construction was dragged away on the water and disassembled again (Designboom, 2013).

The theatre is interesting to this project because of its presence and adventurous use of the water within its concept. Even though the theatre never moved from place to place, the awareness of the possibility for the structure to sail away, and the reminding of the historical theaters that could, was intriguing. Knowing that one day, the theatre could have changed its location and thus its setup and experience, is an interesting concept for a building. Playing with the artistic experience of the performance, from architecture to the stage itself. By creating an unfamiliar and moveable form on the water, Aldo Rossi plays with fascinating parameters in a building. But the interior spatial experience, illustrated below, likewise deserves attention.







ill. 57-60: *The performing space in the Theatre of the World by Aldo Rossi*

The functional use of this space is related to performing and entertaining. In the middle of the room is located a narrow stage in the lowest part of the floor area defined by seating on both sides creating a kind of amphitheatre. Above is three levels of galleries for additional viewers reachable by stairs located outside the main room. This means that the stage is visible from all sides, which creates special demands for the performance being in the centre appealing all the way around, and up. In this way, the spectators becomes involved as a part of the play, because they function as the backdrop of the performance.

The theatre had a capacity of 400 people, 250 of them seated. Above the centre of the stage is a tower reaching 11 meters in the air, with small windows on the side (Wikiarchiteqtura, 2012).

The space is quite simple in shape and it resembles the forms and proportions represented in several of Aldo Rossi's other designs, probably most famous in his coffee pot from the beginning of the 1980s. A tall rectangular shape ending in an octagonal pyramid shape with a delicate sphere on the top.

An aspect in the functional use is the fact that the theatre was designed for temporary use and later disassembly. Which means that the structure should only last for the months during the Biennale and reassembled and used in other contexts. This means that cheaper and not so strong materials have been used and the room appear scraggy with exposed steel structure in some areas.

A few aspects, as I see, have had importance for the spatial creation in terms of functional use. The first and obvious, is visibility and audibility between the stage and the audiences. Hence the centered stage and the tall space above allowing several layers of audiences to experience the performance uninterrupted at the same time. This could also explain the wooden plastering in order to decrease reverberation and thus create a more clear sound from the stage up through the space and to the audience. The room is a spatial extension of the performers in order to create an artistic experience.

Another aspect is the removal of all interruptions within the space. There is hardly any room for moving around and all circulation has been separated from the main room and attached to the outer structure. All the windows have been moved to the top of the structure, increasing the amount of incoming light to window size ratio, and removing the possibility for any outlook. When located in this room the attention is strictly directed towards the stage.

The atmosphere in the space is related to the experience by the performance. The experience has some similarities with the one explained in Schaurons Philharmonie in Berlin. The sharing of the experience together with a small crowd of friends. The spaces for audiences has been divided into several smaller areas containing a part of the overall amount of audiences.

The building is closed of from the outside letting only a small amount of light in the top in, creating a dimmed atmosphere, more suited for focus on the stage than social encounter. The mood of the space is cosy, casual, and comforting. The space should create an atmosphere where the spectators are comfortable enough to mentally leave their own body and surrender all attention towards the universe created in the performance. As a spectator you are supposed to feel intimate with the performer, and as explained, you are supposed to be a part of the performance as a backdrop or crowd. The space encourage the spectators to become a silent co-performer in all the performances taking place within the stage.

Space summary

In summarizing the previous chapter regarding architectural space, the main point is to acknowledge architectural space as the core in all architectural works. Architectural quality should be judged upon its ability to create space.

But as the many aspects in the chapter show, architectural space can be treated in many different ways. The main point is to accept that not a single recipe exists in order to create quality in architectural space. The previous sections outline a few different approaches to spatial creations and understandings. Space as being the contemporary psychological state of mind from the old theoretical art historians, and a combination of sensual and functional approaches to spatial creations represented by the modernist mantra 'Form Follows Function' which resulted in the two case studies.

The point of this chapter has been to articulate space as the essence of architecture. It represents my individual process for building up an understanding of space as being the product of architects and thus the focus of any architectural creation. By understanding this the discussion of architectural quality is stripped from any prejudices of architectural style or taste, which are merely understood as the architects individual artistic expression, and solely discussing the architectures ability to create spaces for humans, and hence how architecture treat humans. This must be the architects greatest job: To create spaces in which humans can thrive.

The sentence summarizing up the chapter is then:

Space is the Essence of architectural creations,
and architectural quality should be judged upon its ability to create space

This conclude the chapter on space. In the following two chapters I will look at how spatial experiences can be facilitated by two different means. The design project will incontrovertible have to deal with water because it deals with aquaculture. That is why the first chapter will concern the effect on spatial experiences created by the presence of water.

ill. 61: *Abandoned mussel poles*

3.2 Water

The use of water in an architectural setting have all the way through history of architecture been an interesting exploration and the numerous extraordinary architectural projects containing water is a reference to the never-ending fascination of this unison. Below is an image of 'The Humble Administrator Garden' from the city of Suzhou in China, which is an example of an intertwined relationship between architecture and water more than 850 years old.

The combination of architecture and water is an intriguing culmination of culture and nature, and should be treated that way. The following chapter will dig into potentials and opportunities related to working with architecture in the presence of water and how this will affect the architectural experience. This will be a crucial assistance in the understanding of potentials of the project and of the design of the spaces related to water required within the project.

ill. 62: *'The Humble Administrator Garden' in Suzhou, China is a classic combination of architectural and water-related experiences*

Today we often experience water in the city in sculptures, fountains, and installations providing immediate superficial water experiences based on physical appearance and embellishment of the urban city, often created by artists. At the same time the humankind possess excessive knowledge for methods of positively using the water for improving the conditions for living. That being methods of cleaning and culturing water, but this knowledge is reserved for professionals, often engineers (Dreiseitl 2005).

Potential rises to approach the way we handle and use water in our city in a new and symbiotic way, thinking the two approaches integrated. On one hand a pleasing of the citizens by using water to embellish the city and create active experiences, and the other concerned about handling bigger urban issues regarding water treatment, culturing, and dealing with social life.

Historically water has been used in cities for many reasons and the importance of water for maintaining a city can be traced back to the vast amount of impressive aqueducts build since the Roman-Empire. On the following page is one of those historical structures from Seguvia in Spain illustrated.

Transportation, abolishing sewage, cleaning, and rituals constitute some of the everyday life functions water has been used for in the city. After the industrialization in the 19th century, waterways were increasingly brought under control, or hidden beneath the ground. We are now experiencing the troubles following this action, in terms of intense pollution of harbours and canals and we are beginning to understand the crucial role water played, and plays, in complex ecosystems everywhere (Dreiseitl 2005, 42). If this has to be bettered in the future of our Urban city, actions needs to be taken.

ill. 63: *The still functioning famous Aqueduct of Segovia in Spain*

As mentioned in the introduction, the tendency is that cities today are taking back the city waterways, illustrated in the picture below with the newly build waterfront in Nørresundby. Harbour fronts is now perceived as an attraction and it is a symbol of high status to be living in the city adjacent to water.
Creating architecture in the context of water provides the opportunity of working with a range of unique architectural potentials based on the combination of water and architecture. Water can enhance the architectural experience but also create experiences in the symbiosis between its own qualities and qualities in architecture. The presence of water in the city and within buildings affects our sense of well being, but also affect influences the environment and the climate.

ill. 64: *Nørresundby harbour front with four newly constructed blocks of high-class apartments*

Water is a unique, natural, and fundamental element to human existence, but in describing water experiences we fall short in the abstraction that constitutes water. Water in itself possesses no recognizable shape and the forms it adopts relates to external conditions like gravity, movement, and boundaries. We have difficulties defining water related to the other senses as well. In solitude, water emits no scent or sound, gives no taste, and no tactility are registered when touched due to its liquid state (Schwenk 2005, 112). Nevertheless are sensual sensations often what we linger on when we describe an experience related to water. In the following qualities related to water experiences has been divided into two superficial topics, the potentials in the combination of water and architecture related to sensual and atmospheric experiences.

Sensual qualities related to water in architecture

When talking about sensual experience related to water, the most immediate experience is related to the sight. Beside the look of water itself, a crucial feature in the visual experience of water is the waters ability of reflecting light and colours from its surroundings. The water surface has an essential influence in defining the visual atmosphere because it enhance the immediate ambiance from the surroundings, mimicking it, mixing them together, and interpreting through the vivacious or calm texture of the water. Especially light are intensively reflected in water surfaces, and in the dark, if no lights are present, the light reflections from the moon could lit up an entire space and hence completely define the spatial experience. Reflections are dependent on the angle of which the spectator sees the water and the angle of the reflected object has towards the water (Woodward 2005, 10). Water reflections contain qualities and if properly used it could create an abundance of visual experiences. Light reflected from exterior to interior, vividly illuminate the spaces at night through reflection and distribution of light, and the reflections of architecture create a unity between building and water.

ill. 65: *Visual reflections of light and form in the water illustrated in the painting 'Starry night over the Rhone' by Vincent Van Gogh*

Sensual experiences, I believe, can be quite convincingly shown in paintings, hence the above painting beautifully illustrates the phenomenon of water reflections. The painting is 'Starry Night over the Rhone' by the Dutch post-impressionist painter Van Gogh.

The water surface likewise reflects sound and hence enhances the present sound scape. Water creates sounds with music-like characteristics: Harmonies, volumes, intensities, and melodies when colliding with external forms and hence experienced the same way as music (Woodward 2005, 11) The unique sound of waves hitting the pillars and piers of the harbour has a distinguished feeling to it, that radiates and defines harbour ambiance. Sounds define the unconscious atmosphere of a space through echoes and reverberations. We become aware of our surroundings and experience the space we inhabit through subtle changes in the sound scape.

Another unconscious way water is experienced is by the scent it emits. The smell and taste of a given space in general has great influence on how a space is perceived. The scent related to water and harbours are especially recognizable and hence constitute a significant part of the experienced atmosphere by the water. Likewise does the scent from a swimming pool stand out and define the space. But as mentioned before, water has no smell or taste in its own, hence the scent related to this are emitting from other sources within the water body. In

the harbour it is kelp, sea salt, and some places the sewage, and in the swimming pool it is the chlorine. But the scents are facilitated and distributed through the water. Hence with architecture it is important to be aware of when to block and when to welcome the water emitted scent related to the sensual experience of space.

All of these sensual stimuli are interrelated to each other, and it is difficult to experience one of them without imagining the rest. Memory and senses is thus profoundly related. Hence in an architectural staging it becomes very important to be aware of how these sensual experiences are facilitated, presented, or neglected because this will inevitably define how the architecture is experienced sensual in relation to the water context.

Below is an abstractive painting illustrating the scent and sound of water. The colours represents the scent of rain, which as I see it, is mimicking and enhancing the context in which it falls. The painting likewise illustrates memory of senses. It is easy to look at this oil painting by the contemporary Belarusian painter Leonid Afremov and at the same time experience the sound and smell of rain.

ill. 66: *The facilitation of scent and sound is illustrated in the oil painting 'Scent of Rain' by Leonid Afremov*

Even though it was stated before that water in itself is neutral in terms of sensual experiences, the former passages illustrate a few sensual experiences related to water. But all experiences rely on external impact. It could then be stated that water is an element that enhance the sensual experience of the surroundings. Water in a contextual situation, could be described as an element, which adapts the features, enhance, and expand the qualities from the immediate surroundings. Down to the chemical constitution, H2O, water interacts with the surrounding substances and pure water is never present in nature due to immediate molecular reactions. Water filters and dissolves everything and adopts these materials into its own being. This also makes water extremely vulnerable. Everything is mixed, and less flattering sensual features are in the risk of becoming multiplied through the medium of water, not to speak of the easy absorption of pollution (Schwenk 2005, 112). Water is vulnerable and should be just as much protected as used in the urban context.

Based on this small investigation into the sensual experiences affected by water, it could be summarized that water possesses two crucial features, which is important when discussing architecture and water. First its ability to reflect all external scents, sounds, colours, and visuals and hence enhance the experience of these. Second, its ability to absorb, facilitate, and distribute materials, and liquids within its own mass and likewise enhance the sensual experience hereof.

Atmospheric qualities related to water in architecture

When talking about spatial qualities in terms of water features, many of the phenomena relevant rely on the sensual notions elaborated in the former section. Water has the ability to create spatial atmospheres of all kind through its great diversity in appearance and sensual appeal. The water related atmosphere depend upon the setting the water is experienced in. The size, shape, and overall appearance of the containment, movements of the water, lighting and its relation to the water, exposure to wind, the sound scape in which the water is experienced, the colours, and the depth of the water mass (Woodward 2005). Each of which can be manipulated to create the exact atmosphere intended.

In spatial understanding water has a severe influence on the environment. In terms of the internal dynamics related to the movement of the water and the physical effect the water have on the surroundings. Wind is often the source disturbances in the water surface, called waves, created by the frictions between wind and the surface of the water. Architecturally, this can be facilitated to some extent. No wind creates a completely still water surface, whilst heavy wind creates waves (Woodward 2005, 11). The movement of the water can be experienced rough like a boat in the middle of the sea, but could also be experienced calm and swaying like sleeping in a hammock. It is dependent on the intensity of the weather, but most likely all facilities placed in a water setting needs to address both situations, because the architecture will be experienced in both circumstances. Whether it being physical movement within the facility itself, or the adjacent environment is rocking in the waves, the architecture will be experienced as in motion and hence needs to relate to the phenomenon.

To visually explain this difference in the spatial perception and condition of a space in relation to the intensity and mood of the waters, a comparison between the South Haven Lighthouse in Michigan exposed to rough and calm water conditions is shown below. It is obvious that each space invite to a different use and behaviour, but the space should be used in both conditions.

ill. 67-68: *A comparison in the spatial conditions in respectively rough and calm water in the South Haven Lighthose in Michigan*

The water itself heavily influence the visual environment of spaces related to the natural habitat of water. The roughness traditionally associated with spaces adjacent to the water is likewise a physical reaction from the water environment that is very important to consider in an architectural project that treats the harbour as an element in the architectural scheme. Materials will experience changes and acceleration of patina if the surface is not properly treated. This will affect both the look but also tactility and the overall experience of the architectural composition. Practically this could potentially start a erosion process within the materials, but creating architecture completely protected from the climate in a harbour setting, would alienate the building from its surroundings. It is therefore important, when building long lasting architecture on the harbour, to understand how the materials would react to the climate and where to allow reactions, and when to protect. The spaces for stay will also be affected by the harsh climate, and outdoor spaces for stay needs to address these challenges, whilst the experience of interior paces, likewise can be affected by the look of the harsh climate. For example experiencing harsh weather from an adjacent protected space will have a substantial impression on the atmosphere within that space.

On the following page is shown an example of how the visual environment is directly affected by the harsh climate associated with water spaces. The old marina Clewiston in Florida has after several years, exposed to the water environment undergone a comprehensive change in terms of material patina.

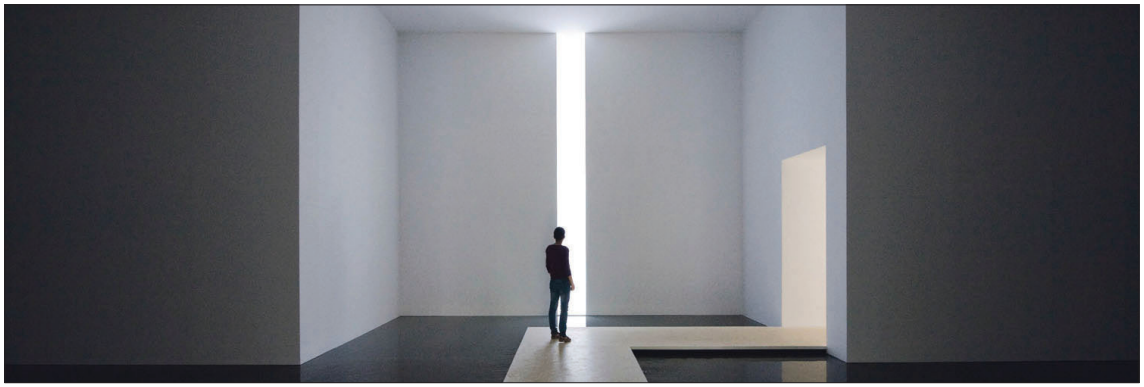
ill. 69: *Rough patination of materials in the old Marina - Clewiston in Florida*

The physical extent of water is also a very important feature when discussing the experience of water related spaces. The extent of water can provide link between spaces, both a physical link and a visual link. Water as an element in an architectural scheme can tie the whole constellation together but also implement experienced qualities in small scales (Wylson 1986). Water can serve as the unifying element between spaces, but also facilitate physical access between them. A crucial aspect in this theme is the depth of the water, the deeper the water, the deeper the tone of the colour experienced in the water. And hence the deeper the water, the darker the tonal experience of the space (Woodward 2005, 11).

Below is an example from the 54th International Art Biennale in Venice in 2011 that treat this specific feature of water. The Greek Pavilion was transformed into a contemporary minimalistic piece of spatial art constellation by the Greek Artist Diohandi, which I have been fortunate to visit in the summer 2011.

The installation can be described as a room completely stripped of any functions and interior and the only thing left in the room was a raised pathway through the space, a vertical light source in the wall, and a water pool covering all the remaining space. The atmosphere and perception of this space was completely defined by the presence of the water.

The sensual experience was defined by silence only disturbed by gently trickling in the water. These sounds was enhanced and bounced from the surface of the walls and water throughout the room. Next was the chilling perceived on the skin of the spectators and the visual of light source in the back wall reflected on the surface of the other walls and the water. The spatial experience was completely changed by the water and the small passage through the space almost felt like a cleansing, through very simple means..



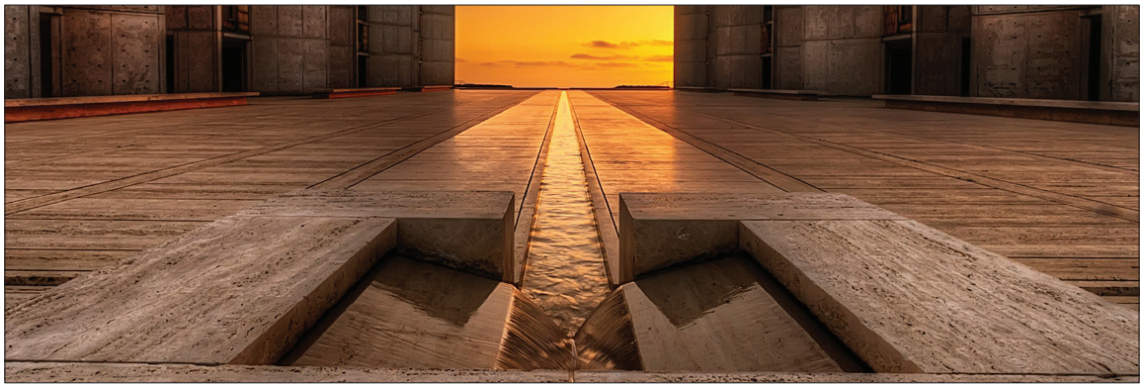
ill. 70 *The Greek Pavilion in the 54th international Art Biennale Venice in 2011*

Atmospheric qualities of spaces containing water is related to sensual experiences discussed in the former passages. The presence of water have an impact on the atmospheric dimension of space by affecting the mood of the space, affecting the surfaces of the materials, and affecting the physical dimension, and coherence. In the following, brief examples of architectural works including water will be examined.

Examples of architecture and water

The exterior spaces by the study rooms in the biological facility at the Salk Institute by Louis Kahn, has a subtle but very delicate treatment of the water rippling through it. Louis Kahn wanted to create an inspiring environment for scientific research: an intellectual retreat. The rectangular and symmetrical plaza constitutes two rows of mirrored buildings on the opposite side of each other. Windows in the buildings are facing the ocean on the far end of the third side of the plaza, and the plaza itself, and all the way in the middle a slit filled with gentle moving water in the concrete pavement is running towards the ocean, parallel with the buildings.

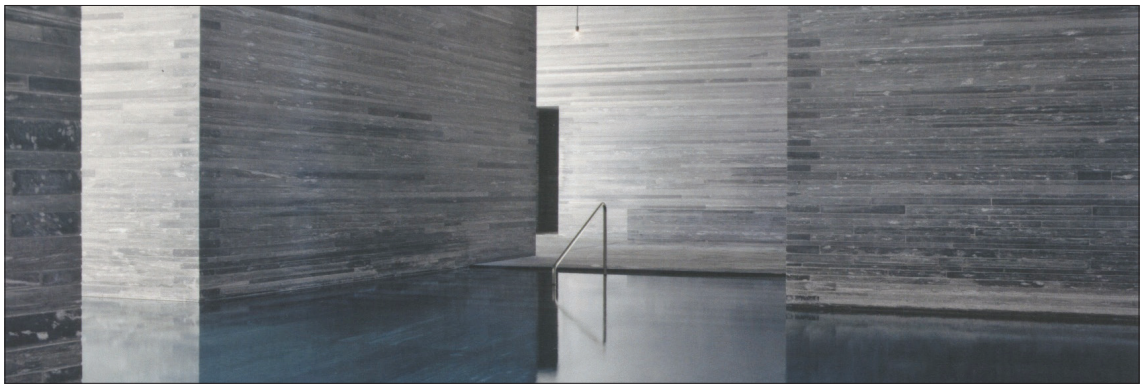
The water in the middle is running in the axis of symmetry in the space, enhancing the symmetric feeling. Even though this space is stripped of anything, except the water line, the plaza is experienced monumental, with a touch of spirituality due to its simple means and elegantly executed parts. The water is creating a connection with the pacific ocean seen in the horizon and is a reminding of the limited scale of the human being. Without the water, this space might have been perceived as dull or leftover space. But by introducing the rippling sound from the water the spirituality of the space is completed.



ill. 71: *Water used on the plaza between the buildings in Salk Institute from 1965 by Louis Kahn*

The interior spaces in Therme Bath in Vals in Austria by Peter Zumthor, are filled with little water pools in different shapes, sizes, and content. Being a bath, the water have a natural reason for being present in the interior spaces, but the experience of these spaces are severely affected by the water. Peter Zumthor wanted to create a feeling reminiscent of a cave or quarry like structure to facilitate a recreational experience. The building constitutes a collection of baths in closed and open spaces, interior and exterior, and a variety of shades and lights together with the water defines the spatial atmospheres. The spaces are carefully placed according to a circulation system within the building, and the paths between them are guided by the water.

The water element are treated due to the overall mean of creating a recreational experience centred around the baths. The gentle sounds and the acoustics, light reflections, and scents emitted by the water serves the overall aim of pleasing the human body and creating a relaxing mood within the space. Just like the Greek pavilion this space is experienced as a path of cleansing generated by the features of water.



ill. 72: *Water as the obvious unifying element in the Therme Bath in Vals by Peter Zumthor 1996*

Water summary

Summarizing the chapter about water and architecture, it becomes evident that water posses a lot of character that would be appropriate to use when the objective is to create architecture in a space containing water. Water has potentials in the terms of sensual and atmospheric experiences. Water enhance the potentials already present by its ability to both reflect and distribute external conditions within its own mass. Water can in this scope be considered as a facilitator of qualities. Furthermore the impact on atmospheric experiences are related to moods, appearance of materials, and coherences within and between spaces.

The chapter ended with a couple of examples where architects used the spatial and sensual qualities of water to enhance the experience of each of their projects. The projects are very different, but the use of water to enhance generate the right atmospheres in the schemes was very inspiring and savvy executed in both.

The conclusion is that water has the ability to facilitate all desired atmospheres within a space, but just as comprehensive as the opportunities is, just as unpredictable is water in its appearance. Hence should the incorporation of water within an architectural scheme undergo very carefully treatment in order to achieve the result wanted. Especially when the water mass is not able to be controlled, like in a fjord.

My position concerning the use of water in an architectural setting, influenced by the former chapters can be summarized in the following sentence:

Carefully treatment of water has the potential of enhancing spatial and sensual qualities already present in a given space

As mentioned before, architectural space will always be related to the functions programmed within that space. If a space is supposed to be judged solely on its purpose of creating a spatial experience, I believe, this space is art. Art can treat space as what it is, and thus represents a more clean spatial experience. From that note, the following chapter of spatial expression in relation to art will be unfolded.

3.3. Art

To me, art has the ability to create appreciations, fascinations, and understandings on a higher level. Art can make us feel something, make us feel a part of something bigger, and create coherences, individual and social, between objects and humans. Art can facilitate and express opinions, ideas, and statements, and inscribe such notions across humans and make them directly or indirectly relate to them. Art can change the understanding and hence heighten the intellectual, the aesthetic, the artistic, or functional appreciation. Art can communicate abstractions and complexity through clear and simple means, easy graspable and comprehensible to even the most critical.

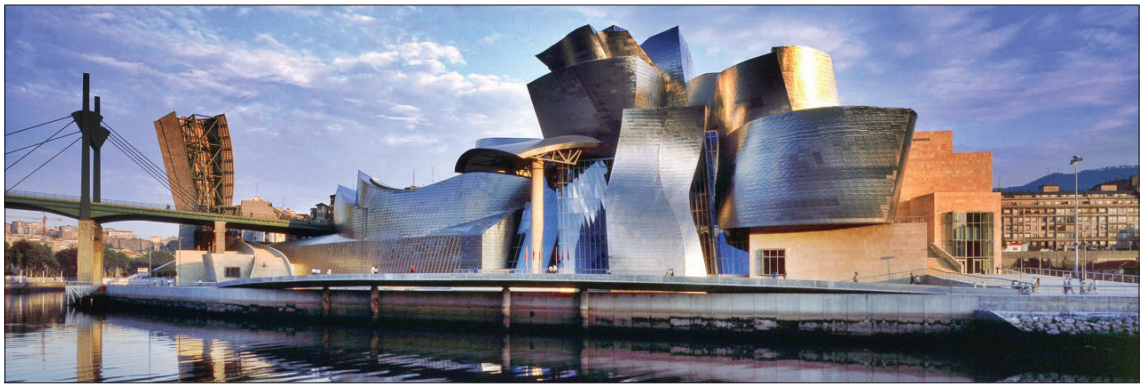
The combination of art and architecture has existed since the dawn of architecture. Throughout the world famous works of combination between architecture and art are present in all cultures ever existed. From the famous paintings in the Sistine Chapel shown below, which completely defines the interior space, to the Guggenheim Museum in Bilbao, shown on the following page, which becomes an artistic sculpture in itself.

ill. 73: *Sistine chapel by Michelangelo*

The difference in art and architecture occurs where art traditionally is not addressing any use and hence function. Art is traditionally related to an intellectual appreciation based on the visual sensation, whereas architecture traditionally needs to facilitate a wide range of functions related to the use of a building. Art will never replace architecture given that architecture has to relate to a given need in the building, and hence require that the building has a purpose and a function. Architecture has to relate to the physical human being and the scale of humans, whilst art has to relate to the human mind, who we are, what are doing and where we are going (Fernie 2003, 102). But inspired by the thinking in art, how art can represent and introduce an idea, an approach, a will, holistic architectural schemes and architectural quality could be enhanced.

Fertile collaborations have been nurtured between architects and artists, which have created innovations in both professions, and some artists and architects have even committed in both disciplines. But since the introduction of computer to the field of architecture, the traditional arts, paintings and sculpture, have been increasingly neglected in favour of pseudo scientific computational methods (Margolius 2003). Great potentials reveals itself within computational methods and integration in the architectural practice, but the art disciplines can likewise nurture fertile interdisciplinary approaches when combined with architecture. The interdisciplinary collaboration do not represent a single method or approach. The initial approach to a collaboration by architects with artists is primarily not to create any two- or three dimensional outcome, but to get inspiration through the artists ideas, philosophies, or thought processes, while others get inspiration through shapes, spaces, materiality, or colours in paintings or sculptures (Fernie 2003). As the architect Jacques Herzog stated after more than 30 years of collaborating with artists in his architecture:

"Over the years we've come to understand ... that artists shouldn't do architecture and architects shouldn't do art"
(Ursprung 2002)



ill. 74: *Guggenheim in Bilbao by Frank Gehry*

But by joining forces and exchange ideas, both disciplines can be further developed through this interdisciplinary approach.

Another approach to this interdisciplinary method of artistic and architectural collaboration is to decode the underlying ideas rooted in the artistic works and use them as inspiration. This method proves to be very inspirational when a collaboration with an artist cant be facilitated.

One of the art forms where artists have begun to blur the line between art and architecture can be seen in the phenomenon of 'Installation Art'. Here artists, among other things, manipulates the atmosphere of space in their works and investigated how spaces can affect human experiences. Related to architecture this space can be categorized as a virgin, unprogrammed space stripped of all functions. The only thing left is the experience of space, and hence can be seen as a source of potentially great inspiration for architects.

In the following sections a brief entering into the subject of art installation will be unfolded. From that the natural and ecological equivalent of Installation Art called Land Art is discussed and the chapter, and report, conclude in a short investigation into the Danish installation artist and sculptor Ingvar Cronhammar.

Installation Art

Installation art grew out of a desire by artists in the 1960s to enhance the visual appreciation of art from the two-dimensional medium of paintings into the vivid atmosphere of space. The phenomenon can be traced back to the 'art' of installing art pieces within a space, which subsequently became an art form itself, related to the experience of that exhibition space, and then space in general (Bishop 2005, 11).

Installation art refers to a type of art, which a viewer physically can enter and/or relate to. The piece of art is often referred to as theatrical, immersive, or experimental. Today, the diversity in the works created under the name has expanded the understanding and a precise definition seem obsolete.

The term installation art refers to the placement of objects in space, the manipulation of space, and how our reactive bodily response relates to this. The uniqueness in installation art is apparent in the way it address the viewer directly as a necessary presence in space for the completion of the work (Bishop 2005, 6). Space can be repealed, manipulated, turned and twisted in order to create a bodily experience. Much of which is highly relevant to spatial creation in architecture.

Installation art often has a significant size resulting in the ability to enter the piece of art by the viewer and becomes a part of it. The work of art stands out in relation to other art forms by not being a representation of something in the world, but presenting the real thing through texture, light, form and mass. Spectators are activated in the work of art. They have to move around or inside the object to receive the experience, in contrast to paintings and sculptures, which is addressing a distancing visual appreciation. The relationship between humans and the piece of art changes. Traditionally humans observe a painting or a sculpture from a given position and only sometimes are allowed to touch them. The perceived spectrum of the work of art defined by the artist and the viewer becomes the centre point in which the piece of art is directed at. In installation art, the space embrace the viewer, and he or she is experienced more decentralized and integrated within the art. It is not necessary that the art have a singular focal point in which the art experience can only be achieved, the experience happens all over the piece and can be different from any position (Bishop 2005, 11).

This art form is interesting to architects because the artists deals with the same medium as architects, but without restrictions from functions, users, and other highly relevant factors to architecture. This means that the artists works with space solely with the bodily experience in mind. The art pieces can be seen as archetypes on spatial experiences, and serve as great inspirations for spatial creations in architecture.

Architecture is not installation art, and installation art is not architecture, but the common denominator is spatial experience in which both can learn from each other.

In the following is a short discussion of The Weather Project by Olafur Eliasson from 2003, exhibited in the old factory hall, Tate Modern in London. The focus of the discussion is on how the work of art through a careful but simple manipulation of space intensively address the viewer, and by which artistic means the experience of that space is carried out. This project is relevant to the design phase due to its delicate manipulation with a single intervention completely changed the atmosphere in this space, to a way the spectators never expected to experience.

ill. 75: *The weather project at the Tate Museum in London 2003 by Olafur Eliasson*

The Weather Project by Olafur Eliasson was exhibited in the Turbine Hall in Tate Museum in London in 2003. The installation consisted of representations of the sun and sky in a mist-filled room. The colours of the lamps creating the sun consisted of mono-frequency lamps, that only emits light from such a narrow spectrum that only yellow and black colours were visible. The construction were accessible and hence a part of the exhibition. (Tate Modern 2014).

The weather is one of the few natural encounters we can still experience in the city. This project is trying to take a part of the weather and bringing it into the building, to experience, and to be taken out in the street again through memory. We experience weather/nature through a medium, television, through the window, or in the weather forecast. By taking the weather inside, Eliasson is expressing this in a spatial composition.

Eliasson wishes to change our perception of the system instead of calling for change. If the individual perception changes, the overall system changes too. His aim is to produce a critical attitude within the viewer, by the means of manipulating the space (Bishop 2005, 80).

Architecturally this experience is only achieved by the simple manipulation of changing the quality of light and filling the air with mist. In this way the space is experienced as something completely different, and changes from what it is, an old factory hall in the grey and rainy London, to a warm Southern European beach during summertime. The art stages the space.

Peoples behaviour in this space changed drastically provoked by this manipulation. A huge amount of people were gathering and laying on the floor in their winter coats mimicking a sunbathing situation, or jumping around as on a playful trip to the beach (Olafur Eliasson 2013).

In terms of architectural spatial manipulation, placing a giant yellow circle in the middle of a space is a quite drastic move. But by acknowledging the bodily experience and thus the change in behaviour achieved by the art, several architectural spatial manipulation can be conceived. Architecture has the same potentials of creating spaces that encourage a certain behaviour or invoke a specific mood within the spectators. The goal is then to create the mood best suited for the situation. This can only be judged through a bodily experience.

Land Art

A type of installation art unfolded itself during the 1960s in America. It was an art form growing out a desire to take the step from exhibiting art that represented nature in the sterile environment of the museum, out in the real nature. A movement towards art as objective, instead of representation of the objective.

The desire arose from a rejection of the gallery as a frame of art and the art world as an economic system in defiance of artistic integrity. The artists started to express themselves through the means of site-specific sculpturing in rural or urban surroundings. This art form has been dubbed Land Art. Other refer to this art movement as Ecological Art (Kastner 1998, 12).

Artist practicing Land art are making use of the same fundamental ideas of the art of space as artist practising installation art. But instead of using the spaces in a museum or gallery, they are using the natural scenery from the real world, and hence blurring the line between art and architecture even further. The artists started to use the natural means instead of creating replicas in the museum representing the real thing from nature. The means in which the works of art can be carried out within this phenomena varies from manipulation of the landscape to placing natural or man-made objects within the rural or urban spaces to invoke artistic experiences (Kastner 1998, 1).

By working with the local environment and site-specific qualities, Land Art can express the cultural and historical legacies contained in a given site. By simple means the act of executing the art can manifest itself within a wider audience and create experiences related to the local environment and culture. The art itself is experienced as a part of the local spaces and hence act as a mirror or catalyst of the qualities in local history and culture. The art becomes more than the piece itself, it becomes a mean for the creator to identify himself within the world, to express culture, history, or ideas within the urban or natural realm.

In terms of architecture this phenomenon is interesting due to its manipulation of objects present in the real world. Understanding how objects in the real world can contain knowledge, information, and experiences based on culture or history. An approach put on sculptural manipulation that easily can be adopted to architectural creations. Architecture will by its solely existence contain a legacy and express identity and information.

Like installation art, Land Art deals with the sculpturing of void and matter, space and mass in the real world, but without the restrictions like architecture. The pieces created within the ecological art movement can thus be inspiration for architects, as the art pieces only concerns the experience from the spectator.

The following example of Land Art will be looked at with the desire to clarify how the art is facilitating the experience of the space it inhabits and by which artistic means they are carried out.

ill. 76: *Parc Metisse, Isle of Derborence from 1992 in Lille, France*

Isle of Derborence, designed by the French gardener, garden designer, and botanist Gilles Clément, was finished in 1992 and consists of a man-made butte occupying 3.500 m^2, raised with a straight edge 7 meters in the air. This case shows how a simple artistic mean can heighten the understanding and appreciation of a space.

Over the 20 years the installation has existed it has nurtured a unique autonomous ecosystem with a rich culture of faun and flora, never disturbed by mankind. In this way humans can understand, appreciate, and investigate the natural composition of the natural occurrence of faun and flora (Gilles Clement 2013).

The installation encourage an appreciations of the local faun and flora and creates a social feeling of local ownership. It directly facilitates the local heritage and history and makes it tangible. It represents a statement regarding the protection of the local environment, and the statement contain ecological and sustainable ideas rooted in the local environment and history. The spatial understanding of the space is instantly changed, due to the only partly visible, unreachable space. Summarized the art stages nature.

It has become a protected space, completely overtaken by the ecosystem. An abstract and complex idea of nurturing local faun and flora and making it clearly understandable through the piece. These features is evident by the simple idea of extruding the ground.

In this project the artistic mean is not the 'product' of the installation itself, the desired outcome of the project is grown out of the ground. The artistic mean is to facilitate a medium in which the faun and flora can grow from. The art experience itself is derived from nature. In relation to urban farming this is quite an interesting concept. Urban Farming rely on the same natural mechanism as this piece of art nurture from, and is thus a very interesting inspiration.

As the quote by Richard Ingersoll stated in the motivation section from the first chapter, this concept could be part of the solution that started to infiltrate meaning into the landscapes that Urban Farming activists are creating.

In the following a short investigation into one of the greatest installation artists who also have worked in the medium of nature, will be investigated. Ingvar Cronhammar is an art figure in which I personally have found great inspiration, and thus is included in this chapter on art.

Ingvar Cronhammar (1947)

ill. 77: *Ingvar Cronhammar*

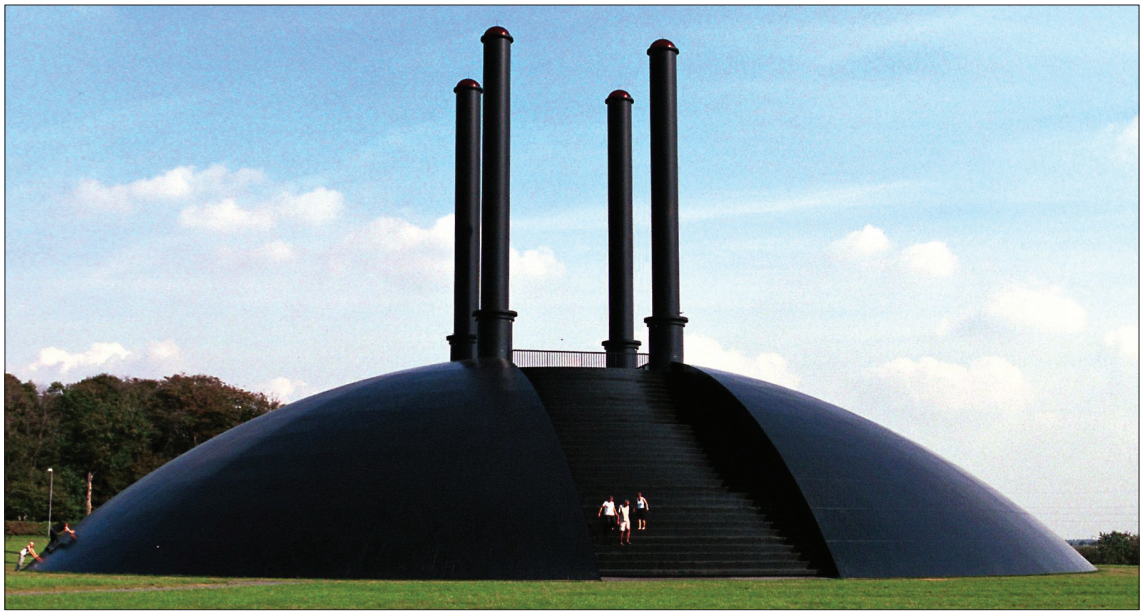
Ingvar Cronhammar is an original Swedish-born but Danish sculptor working primarily in the field of large structures integrated in the realm of cities and landscapes. He is a very private person often letting the works of art he creates express his inner thoughts through intensive animalistic force, mysterious wonder, and an elegant and careful sense of detail.

He appear as a strong, grandiose figure, reminding of a contemporary Viking with his extensive grey beard and huge majestic physical appearance. One seem to recognize a distinctive connection between the art he creates and his appearance (Weirup 2008). In his projects he tries to relate to big questions in life of the contemporary spirit and the essence of the meaning of existence. He tries to artistically process his abstract thoughts about life and about existence in his works, which primarily takes point of departure in a critique of the daily mudslinging and nonsense that also permeates the public art and culture life (Weirup 2008, 13).

In relation to architecture Cronhammar is interesting because he through his work has been involved in fertile collaborations with architects. He represent an artists approach to the collaboration and his work undoubtedly has had influences from architects and architecture, but certainly also the other way around.

Furthermore I myself have had the pleasure of meeting Ingvar and learned a few significant lessons about art, life and architecture from him. He has had influence on my understanding of creation and hence is a substantial figure to me in the process of defining my approach to architecture.

ill. 78: *Visit at Cronhammars house in 2012*



ill. 79: *Elia In Herning build in 2001*

Elia

Elia might be one of Cronhammars most significantly published works. The enormous sculpture is placed on a field little outside Herning in the middle of Jutland. It is constructed from concrete and steel. The circular footprint has a diameter of 60 meters, and the structure rises 32 meters in the air. Four stairs pointing at each corner of the world takes the visitor from ground level to a platform placed 11 meters above ground where a great hole on the top in the middle makes the inner of the structure visible, but unreachable. Four columns ending in four red dimmed lighting half spheres rises from the inner of the structure. On the end of the four columns are likewise placed four lightning conductors and in the middle of them a fifth column two meters below the platform contains a gas burner. On a random time within in an 18 day cycle, an 8,4 meter tall flame will burst in the air from this column for 25 seconds. (Elia.dk 2014).

This structure is relevant for the design project at hand in its ingenious way of using natures abilities in creating an artistic experience.

People see this as an alien structure, a temple for technology. It gathers information about human kind, but we do not know what kind of information and we cannot use it. The structure has been compared to the black monolith from 'A Space Odyssey 2001', which is constructions placed on earth by an intellectual superior alien race to help intelligent life on earth on their way (Weirup 2008, 218). The construction has the ability of 'responding' as Cronhammar explains it, by attracting lightning through the conductors. The body of the structure can resonate the sound from the lightning and transmitting it back with a 40 time amplification of its original volume. (Weirup 2008, 220)

Elias nature is pending. The real artistic experience, of the lightning and the flame, has only been registered by a few people. The real alluring phenomenon of the structure is not the act itself, but the myth about the act. The experience is related to imagination, and not the material presence. The structure is most captivating when experienced in solitude, and the stories about its abilities are enchanting our minds while we in silence consider its majestic exterior.

This structure uses nature, or the ability of nature, in its extreme in creating the artistic experience. The art happens in an interesting meeting between nature and culture, where the artistic experience is the undefined meeting between imagination, myth, and silence. The art stages the narrative.

This structure represents the greatest lesson I learned from my encounter with Cronhammer, that some experiences should not be easy accessible and one should earn the honour of receiving them.

Art summary

It would be a shame to believe that the previous chapter fully covers investigations into all the subjects in which architecture can be inspired by art. Art has always been a major inspiration to architecture in infinite ways, and the ones mentioned above only represents a tiny fraction of those. The examples chosen were because of similarities in the treated subjects and with an expectation for them to introduce new inputs to the design phase.

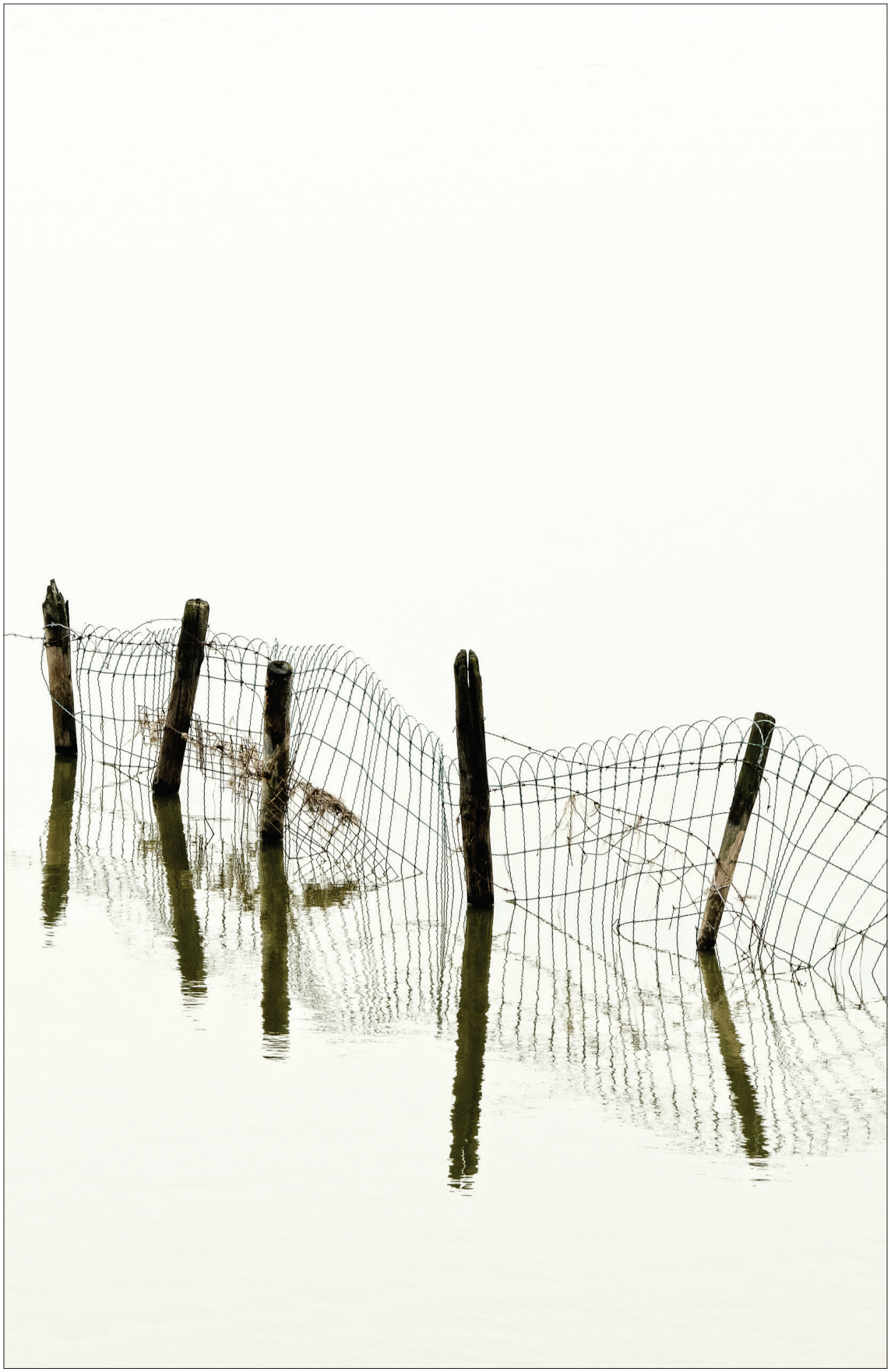
The three cases and art forms are treated as different kinds of staging. Installation Art are treated in regards to how the art stages the spatial experience. How the artistic approach can influence how we perceive space. In the chosen example by Olafur Eliasson the manipulation of space relates to how the light can affect our perception of the given space and how that ultimately changed human behaviour.

In the second subject of Land Art the focus was on how art stages nature. How nature can be manipulated to achieve the artistic experience of that nature. The example from Lille in France treated an extruded piece of land raised the question of nature and culture. In this case the desire was likewise to start to introduce art within the Urban Farming Context. By thinking Urban Farming through the Land Art agenda, Urban Farming can be perceived as something more and legitimate within the city.

In the third section a deeper investigation into Ingvar Cronhammar who in some of his works has dealt with some of the themes affected within the two other art forms. But more importantly he was chosen because of his direct influence on my learning to become an architect. The example by Cronhammar was dealing with the staging of the narrative. How the artistic experience emanated from the non physical but concentrated around the physical.

Through these cases insights into how artistic thinkings can assist architectural agendas have been investigated. Potentials in deliberately using the artistic experience in the architectural scheme and as a mean of introducing Urban Farming within a dense city has been derived. Thus the outcome from the previous chapter can be summarized as:

Great potentials unfolds itself by utilizing the Artistic experiences as a mean of introducing Urban Farming within the city fabric through architecture



ill. 80: *Abandoned mussel poles*

3.4 Spatial investigations summary

Through these investigations the approach to creating architecture in the design part has been outlined. The chapter has focused on building up a knowledge from which an architectural creation can emanate. The architectural creation should be based on the understanding that "*Space is the essence of architecture*" and with inspiration in art and knowledge on the effect from the presence of water. Through the above examinations of the subjects related to the architectural part of the project, a few clues reveals itself to how a spatial creation should be unfolded, which in the following will be composed in a few design guidelines.

Space is the essence of architectural creations, and the quality architecture should be judged upon its ability to create space. Architectural style represent the inner expression of an architect, but the spatial creation express how architecture treat the human being. Therefore is spatial creation the ability in which architecture should receive is main judgement in order to reveal architectural quality.

Acknowledge space as the essence of architectural creations

The atmosphere of a space was to the art historians considered as the physical manifestation of the contemporary collected psychological sense of being. Through this mindset we must understand that contemporary spatial creation is a proposal of how the world is understood by the contemporary man. Spatial creations can be understood as a way for architects to understand the world, and to manifest these ideas in a spatial composition.

Architecture is a product of its age, and architects should express this in spatial form

Space cannot be treated only in relation to functional use or sensual experience, but needs to be developed with respect for both. The function of a space defines the boundary in which the spatial creation is experienced, while the sensual experience is the way we perceive the space. In architecture it is not possible to disassemble these two notions and thus should be developed together.

Functional use and the experience of a space should be designed to accompany each other

Carefully treatment of water has the potential of enhancing spatial and sensual qualities already present at a given space. The presence of water has the ability to reflect and distribute the smallest features, and desired and undesired, already present, and thus a treatment of architectural scheme in which water plays an important role carefully considerations needs to be undertaken.

Water strongly enhance features, desirable as undesirable, it is exposed to

Great potentials unfolds itself by utilizing the artistic experiences as a mean of introducing Urban Farming within the city fabric. Urban Farming can take advantage of artistic methods in order to express deeper meaning and thus create well rooted projects founded on something more than food production. Art can give reason and create meaning emanated from culture and history.

Architects has the potential of creating meaningful Urban Farming landscapes inspired by Art

These design guidelines is the final result of the architectural investigation that cover the complete output of the last chapter. In the following I will conclude on the whole theoretical work.

ill. 81: *Architectural Summary*

4.0 Conclusion

The objective of the preceding theoretical chapters was to identify potentials in making an architectural treatment of the Urban Farming phenomenon. Furthermore the thesis sought out to discuss the term architectural space and how we as architects should relate to this notion today, and how this can be related to Urban Farming.

The thesis was divided into two overall parts. The first focusing on functional issues centred around Urban Farming, the other focusing on architectural issues centred around architectural space. Initially they will be concluded on separately.

The functional chapter took point of departure in the potentials in Urban Farming in general and from there entered the subject of potentials within aquaculture. The Urban Farming phenomenon has opened up a new way in which we as citizens can experience and use our cities. Great potential improvements within the general health of the population, social gatherings, cultural and historical legacies, and sustainable living can be related to the introduction of Urban Farming in the city.

The phenomenon have several potentials in relation to creating attractive urban spaces. But in order for the movement to reach its full potential, a few changes will have to be made. The food supplying chain should be a model containing both rural and urban production. The food production chain, and thus urban farming, need to be planned on an urban level utilizing the rural and urban productions to what they individually are good at. Architects can through architecture express potentials of sustainable urban living and thus stage the qualities of Urban Farming within the expression of the city. Urban farming should emanate from local, historical, and cultural legacies, and thus create a connection between the city and place.

These changes construct what I believe needs to be made in order to facilitate the paradigm shift that can nurture a city planning strategy that can contain an Urban Farming phenomenon in its full potential.

The architectural chapter takes point of departure in the notion of architectural space. Through reviews of German art historians who unfolded the notion more than hundred years ago, the argumentation for acknowledging architectural space as the essence of architecture was build up, and through the two sections concerning water and art, specific means for working with the spatial experiences was reviewed related to the design part of the project.

Buildings and architecture are judged upon its ability to frame the scenery for every situation in human life. Architectural space is acknowledged as a product of its age and the spatial experiences emanates from this principle. The task of an architect is to express this in spatial form, and create spaces in which humans can thrive. A given space will always have a functional need, and if this need is not satisfied, any spatial experience will be blurred by the lack of functional care. On the other hand a solely functional room will lack a spatial experience and thus will be considered less suitable for human living. The goal is to consider both in creation of spaces.

The chapter considered two different means in creating architectural space. The means of water was related to the necessity of building with water when creating spaces for aquaculture. The outcome of this section was related to waters ability to, enhance, reflect, and distribute features exposed to the water. This creates exciting possibilities for creating unique spatial experiences related to water.

By looking at how some artist have treated spatial experiences inspirations of using nature, and urban farming to express values related the local culture and history through art and architecture became evident. Potentials in rooting the phenomenon of Urban Farming within the city, and the culture, and thus and creating meaningful landscapes became the inevitable outcome of this theoretical thesis.

ill. 82: *Conclussion*

5.0 References

5.1 Litterature

Aalborg Kommune 2013a, *Fysisk Vision 2025*, (online) Available from: <http://www.e-pages.dk/aalborgkommune/690/> [13 November 2013].

Berlage H. P. 1908, *Grundlagen und Entwicklung der Architektur*, Amsterdam: Ellermann, Harms & Co. (Online edition) Available from: <http://tinyurl.com/oneaj46> [31 October 2013].

Bishop, C. 2005, *Installation Art*, London: Tate Publishing

Bridge, Helen 2010. *Empathy theory and Heinrich Wölfflin: A reconsideration*, Journal of European Studies vol. 41 no. 3. Available from: <http://www.jes.sagepub.com/content/41/1/3> [28 October 2013].

Clay, R. A., 2001, *Green is good for you*, Monitor on Psychology, April 2001 vol. 32 No. 4, p. 40

Collins, P. 1965. *Changing ideals in Modern Architecture*. London: McGill-Queens university press

Dahlager, Lars 2012, *Tomater gror da bedst på skraldeskuret*, Politikken, Spis&Bo, august 19 2012, pp. 4

Davies, C. 2011, *Thinking about Architecture - An Introduction to Architectural Theory*, London: Laurence King Publishing

De Long, D. G. 1988, *Frank Lloyd Wright and the Living City*, Milano: Skira Editore S.p.A.

Dewey, W.; Davis, J. P.; Cheney, D. C. 2011, Shellfish aquaculture and the environment: An industry perspective, *Shellfish: Aquaculture and the Environment*, edited by Shumway, S. E., Hoboken New Jersey: Wiley-Blackwell: 33-50

Doron, G. 2005. *Urban Agriculture: Small, Medium, Large*. Architectural Design, May/June 2005 p. 52-59

Dreisetl, H.; Grau, D. 2005, *New Waterscapes: Planning, Building, and Designing with Water,* Basel, Switzerland: Birkhäuser

Fishman, R., 1977, *Urban Utopias of the Twentieth-century - Ebenezer Howard, Frank Lloyd Wright, Le Corbusier*. MIT press

Fernie, J., 2003, *Concrete Relationships: Artists and Architects in Collaboration*, Architectural Design, May/June 2003, p. 101-106

Frank, K. A. 2005a. *The city as dining room*. Architectural Design, May/June 2005, p. 5-10

Frank, K. A. 2005b. *Food for the City, Food in the City*. Architectural Design, May/June 2005, p. 35-42

Gehl, J, 2010, *Byer for mennesker*, København: Bogværket

Howard, E. 1985, *Garden Cities of To-morrow*, 4td edition, Bristol: J. W. Arrowsmith Ltd

Ingersoll, R. 2013, Design Observer, *Eat the city*, 17.06.13, (Online) Available from: www.places.designobserver.com/feature/eat-the-city-the-art-of-urban-farming/37909/. [18. October 2013]

Ipsen, D. 2005, Towards a new water cuture, *New Waterscapes: Planning, Building, and Designing with Water, edited by Dreiseitl H. and Grau, D.* Basel, Switzerland: Birkhäuser: 10-11

Kahn, L. 1967, Space and the inspirations, *Louis Kahn: Essential texts*, edited by Robert Twombly, London: W. W. Norton c2003

Kastner, J. 1998, *Land and Environmental Art,* New York: Phaidon Press.

Kiib, H, 2007, *Harbourcape*, Aalborg: Aalborg University Press

Knudstrup, M-A 2003, *'Integrated Design Process i PBL'*. Aalborg: Aalborg University Press

Le Corbusier 1971, *The City of Tomorrow*, 4th edition, England: The Architectural Press Ltd.

Lobell, J. 1979, *Between Silence and Light*, Boston: Shambhala Publication, Inc.

Lindahl, O. 2011, Mussel farming as a tool for re-eutrophication of coastal waters: Experiences from Sweden, *Shellfish: Aquaculture and the Environment*, edited by Shumway, S. E., Hoboken New Jersey: Wiley-Blackwell: 217-238

Mallgrave, H. F. 2005. *Modern Architectural Theory: A historical survey*. Cambridge: Cambridge University Press

Mallgrave, H. F. 1994, *Empathy, Form & Space*, Santa Monica Califonia: Getty Center for History of Art and the Humanities

Margolius, I. 2003, *Introduction*, Architectural Design, May/June 2003, p. 9-13

Pallasmaa, J. 1996, *The eyes of the skin*, England: Wiley Publishing

Petersen, J. K.; Maar, Marie; Holmer, Marianne 2010, *Muslinger som virkemiddel - Et pilotstudie*, (Online) By- og Landsskabsstyrelsen, Available from: <http://forskning.skaldyrcenter.dk/files/Muslinger%20som%20virkemiddel_rapport.pdf> [12 November 2013].

Schmarsow, A. 1893. Essence of Architectural Creation, *Empathy, Form, & Space*, edited by Mallgrave H. F., Santa Monica Califonia: Getty Center for History of Art and the Humanities: 281-297.

Schwenk, W 2005, Water as an Open System, *New Waterscapes: Planning, Building, and Designing with Water, edited by Dreiseitl H. and Grau, D.* Basel, Switzerland: Birkhäuser: 112-128

Smit, Jac 2011, Food, *Urban Agriculture - Food, Jobs and Sustainable Cities*, (e-book) Available from <http://jacsmit.com/book.html> [11 November 2013].

Smithson, Robert 1967, *Towards the development of an Air Terminal*, Artforum, Summer

Stanwick, S. & Fowlow, L. 2010, *Wine by Design*, 2nd edition, Chichester: Wiley and Sons Ltd.

Stickney, R. R. 2009, *Aquaculture - an introductory text*, 2nd edition, Cambridge: Cambridge University Press

Sullivan, L. 1896, The Tall Office Building artiscally considered, *Lippincotts Magazine* edited by Owen Hall, (Online) Available from: < https://ia700403.us.archive.org/11/items/tallofficebuildi00sull/tallofficebuildi00sull.pdf> [27 November 2013].
Tidwell, J. H. 2012, *Aquaculture Production Systems*, Hoboken New Jersey: Wiley

Todd, N. J.; Todd, J., 1984, *Bioshelters, Ocean Arks, City Farming: Ecology as the basis of design*, San Francisco: Sierra Club Books.

Tschumi, B. 1994, *The Manhattan Transcripts*, New edition, London: Academy Group Ltd

Tschumi, B. 1996, *Architecture and Disjunction*, Cambridge, Massechusetts: The MIT Press

Ulrich, R. S. 2002, *Health Benefits of Gardens in Hospitals', Proceedings of international conference Plants for People*, Availablbe from: <www.greenplantsforgreenbuildings.org/attachments/contentmanagers/25/HealthSettingsUlrich.pdf> [19 November 2013]

Ursprung, P. 2002, *Herzog & de Mouron: Natural History.* Bade, Switzerland: Lars Muller

Vldler, A. 1998. Space, Time and Movement, *At the end of the century, one hundred years of architecture*, edited by Koshalek, R., Smith, E. A. T., Zeynep, C. Santa Monica Califonia: Harry N. Abrams: 101-125.

Vischer, R. 1873. On the optical Sense of Form: A Contribution to the Aesthetics, *Empathy, Form, & Space*, edited by Mallgrave H. F., Santa Monica Califonia: Getty Center for History of Art and the Humanities: 89-123.

Webb, M. 2005, *Adventurous Wine Architecture*, Melbourne Australia: The Image Publishing Group

Weirup, T. 2008, *Tystnaden - En fortælling om Ingvar Cronhammar*, København: Aristo

Wöllflin, H. 1886. Prolegomena to a Psychology of Architecture, *Empathy, Form, & Space*, edited by Mallgrave H. F., Santa Monica Califonia: Getty Center for History of Art and the Humanities: 149-190.

Woodward, R 2005, Water in Landscape, *New Waterscapes: Planning, Building, and Designing with Water, edited by Dreiseitl H. and Grau, D.* Basel, Switzerland: Birkhäuser: 10-11

Wylson, A. 1986, *Aquatecture, Architecture and Water*, London: The architectural Press Ltd.

Zucker, P. 1951. The Paradox of Architectural Theory at the Begin of the Modern Movement, Journal of the Society of Architectural Historians 10:3 (Oct. 1951): 8-14.

5.2 Websites

Aalborg Kommune 2013b, (website) Available from:
<http://www.aalborgkommune.dk/kultur-og-fritid/Natur/Aktivt-friluftsliv/Sider/Aalborghaver.asp> [21 November 2013]

ANFA, 2014, (website) Available from: < http://www.anfarch.org/mission/> [21 April 2014]

BST Oysters 2009, (website) Available from: <http://www.bstoysters.com/index.php?id=products_farm%20layout>
[10 December 2013]

City Pig 2009, video, youtube, 26. January 2010, <http://www.youtube.com/watch?v=x45OMlAXf6A> [12 December 2013]

Dansk Skaldyrcenter, 2013a, (website) Available from: <http://www.skaldyrcenter.dk> [20 November 2013]

Dansk Skaldyrcenter, 2013b, (website) Available from: <http://www.e-learning.skaldyrcenter.dk> [20 November 2013]

Designboom, 2013, (Website) Available from: <http://www.designboom.com/history/teatromondo.html> [21 April 2014]

Elia 2014, (website) Available from <http://www.elia.dk> [25 April 2014]

Gilles Clement 2013, (website) Available from: <http://www.gillesclement.com/cat-banqueimages-matisse-tit-Parc-Matisse-Lillle>
[24 April 2014]

Harbourfarm 2013, (website) Available from: <http://www.harbourfarm.org> [07 November 2013]

IIT 2014, (website) Available from: < http://www.iit.edu/arch/faculty/mallgrave_harry.shtml> [06 January 2014]

Harvard Scool of Public Health 2013, Omega-3 Fatty Acids: An Essential Contribution, (Online) Available from:
<http://www.hsph.harvard.edu/nutritionsource/omega-3-fats/Z> [14 November 2013]

H.P.B 2014, (website) Available from: <http://www.hendrik-petrus-berlage.com> [30 April 2013]4

Jac Smit 2013, (website) Available from: <http://www.jacsmit.com/jacbio.html> [25 November 2013]

Liukkonen, Petri 2013. Heinrich Wölfflin, Kuusankosken Kaupunginkirjasto, Finland. Available from:
<http://www.kirjasto.sci.fi/wolfflin.htm> [28 October 2013].

Maritme Nyttehaver 2013, (website) Available from: <http://www.maritimenyttehaver.dk> [07 November 2013]

Meyers Großes Konversations-Lexikon 1905, 6th edition, Leipzig, Germany (Online edition). Available from:
<http://www.zeno.org/Meyers-1905/A/Vischer+%5B2%5D> [30 October 2013].

Neue Deutsche Biographie 2007, Berlin, Germany (Online edition). Available from: <http://tinyurl.com/on9z4z4>
[29 October 2013].

Olafur Eliasson 2014, (Website) Available from <http://www.olafureliasson.net/works/the_weather_project_9.html>
[24 April 2014]

Sorensen, Lee 2010. Robert Vischer, Dictionary of Art Historian (website). Available from:
<http://www.dictionaryofarthistorians.org/vischerr.htm> [30 October 2013].

Sorensen, Lee 2012. August Schmarsow, Dictionary of Art Historian (website). Available from:
<http://www.dictionaryofarthistorians.org/schmarsowa.htm> [29 October 2013].

Sorensen, Lee 2013. Heinrich Wölfflin, Dictionary of Art Historian (website). Available from:
<http://www.dictionaryofarthistorians.org/wolfflinh.htm> [28 October 2013].

Tate Modern 2014. The Weather Project (Website) Available from
<http://www.tate.org.uk/whats-on/exhibition/unilever-series-olafur-eliasson-weather-project/olafur-eliasson-weather-project>
[24 April 2014].

Ysios Bodegas 2012, (website) Available from: <http://www.ysios.com> [01 November 2013]

Wikiarchiteqtura 2012, (website) Available from: <http://en.wikiarquitectura.com/index.php/Theater_of_the_World_in_Venice>
[21 April 2014]

5.3 Illustrations and pictures

1.0 Introduction

1.1 Motivation

1.2 Method

1.3 Knowledge map

2.1 Urban Farming

2.2 Aquaculture

2.3 Functional Summary

3.1 Architectural Space

3.2 Water

Chinese garden	ill.62	*http://uscaau.files.wordpress.com/2010/11/img_6311.jpg*
Aqueduct	ill.63	*http://upload.wikimedia.org/wikipedia/commons/1/10/Aqueduct_of_Segovia_02.jpg*
Nørresundby havnefront	ill.64	*Photo by Sylvester Ellekær Michaelsen*
Starry Night over the Rheine	ill.65	*http://host2.images.cdn.fotopedia.com/flickr-3430288669-max_2560.jpg*
Scent of Rain	ill.66	*http://afremov.com/image.php?type=P&id=18330*
Lighthouse calm	ill.67	*http://2.bp.blogspot.com/-uZE8vK3ft8A/TeYwgWNdQnI/AAAAAAAAB74/rVHnxRfmMKo/s1600/Michigan+111.jpg*
Lighthouse disturbance	ill.68	*http://juliesmindsedge.files.wordpress.com/2010/09/774.jpg*
Marina	ill.69	*http://captainkimo.com/wp-content/uploads/2011/06/old-fishing-boats-fisherman-marina-clewiston-florida.jpg*
Greek Pavilion Venice	ill.70	*http://www.lifo.gr/uploads/image/326650/venezia2.jpg*
Salk Institute	ill.71	*http://st5.geg.cz/photo/365262_detail.jpg*
Therme Bath Vals	ill.72	*http://theredandthewhite.files.wordpress.com/2012/02/vals_central-bath.jpg*

3.3 Art

The Sistine Chapel	ill.73	*http://blogs.suntimes.com/news/Vatican%20Sistine%20Chapel.jpg*
Guggenheim Bilbao	ill.74	*http://paradiseintheworld.com/wp-content/uploads/2012/06/bilbao-guggenheim.jpg*
The Weather Project	ill.75	*http://partnouveau.com/wp-content/uploads/2013/04/url-5.jpeg*
Isle of Derborence	ill.76	*http://www.gillesclement.com/fichiers/_banqueimages-matisse_06495_parc-Matisse-Lille-L-ile-Derborence-et-le-Boulingrin-086.jpg*
Portrait Ingvar Cronhammar	ill.77	*http://multimedia.pol.dk/archive/00615/Ingvar_Cronhammar_615083a.jpg*
Cronhammaer residence	ill.78	*Photo by Patrick Ronge Vinther*
Elia	ill.79	*http://www.denstoredanske.dk/Kunst_og_kultur/Billedkunst/Kunstnere,_danske/Ingvar_Cronhammar*
Abandoned mussel poles	ill.80	*http://farm9.staticflickr.com/8512/8524900216_e45646d13e_o.jpg*

3.4 Architectural Summary

Architectural Summary	ill.81	*http://features.cgsociety.org/newgallerycrits/g74/166074/166074_1222335328_large.jpg*

4.0 Conclusion

Conclusion	ill.82	*http://farm6.staticflickr.com/5258/5582408650_c253e3aaef_o.jpg*