Textile Architecture: design, computation & fabrication

Université Libre de Bruxelles

Faculty of Architecture La Cambre-Horta

LAD| Digital Architecture Laboratory.

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Bruxelles | Belgium

Course Directors

Aldo Sollazzo (Noumena)

Tutors

Laura Civetti

Florencia Arezzo

Workshop coordinator and Tutor

David Erkan

Textile Architecture

Course Directors David Erkan
Tutors Aldo Sollazzo
Laura Civetti
Florencia Arezzo

The Brief

Textile | Architecture is a workshop aimed to explore new relationships and links between different disciplines, specifically between Architecture and Fashion design. The research will be focusing on the ergonomic scale, therefore we will look at Architecture in the form of a small scale structure, such a shelter, and Fashion in the form of a wearable construct and both will be explored, in the eyes of sustainable criteria.

During the last two decades, both disciplines have been drawing influences from each other, in terms of form finding processes, digital techniques, digital fabrication processes, material organization and more. These industries are in constant transformation and advancement; hence their relationships are in constant flux and relentless new formation.

In this workshop, we are inviting the students to research this new formation by working collaboratively to construct a 3d manifestation of this new link, as a form of a meaningful intervention, contributing to the city and is site-specific to Brussels. This intervention will suggest an efficient way of installation and dismantling, exploring sustainable ideas aligning with environmental considerations, which are in the heart of current global concerns.

Students will be exposed to new advanced computational skills, fabrication tools, form finding and current theoretical thinking, guided by professionals from the academic world and practitioners from both disciplines.

Theoretical concepts

'Second to oil, fashion and textiles is the most polluting industry in the world. Every stage in a garment's life threatens our planet and its resources. It can take more than 20,000 litres of water to produce 1kg of cotton, equivalent to a single ta-shirt and pair of jeans. Up to 8,000 different chemicals are used to turn raw materials into clothes, including a range of dyeing and finishing processes. And what becomes of the clothing that doesn't sell, falls apart or goes out of style? More often than not, it is discarded in giant landfills. How can the fashion industry become more sustainable?'

(Extracted from the website www.bussinessoffashion.com)

If we look closely to these two disciplines, though, we would discover that they are not just iconic activities, they are also systemic activities, and in fact they are mediums to organize relationships and communication between the three distinct worlds we know: spiritual, physical and digital. And they do so mostly engaging in a transversal ecological praxis. They are, in other words, capable to construct not just spaces or garments, but proper cognitive maps.

We are interested to discover if there is a way to combine the knowledge, models and tools of these two disciplines in a sort of 'cyborgian hybrid' capable to investigate and deal with resilient scenarios of ecological praxis where, to quote Guattari, 'the psyche, the socius, and the environment are not regarded as separate'.

We believe that the key to such a challenge resides in the concept of Transdisciplinarity.
Transdisciplinarity could be the key from a resilient and ecological point of view, as well as from an aesthetic one, to the revaluation of the hermeneutics both in architectural and fashion.

Transdisciplinarity is a synthesis between disciplines that destroys academic barriers and creates new disciplines in which everything is more than the sum of the parts and which relates to the complexity theory.
It is a form of mental infrastructure applied in the search of a new praxis. It is about transgressing boundaries in search of a meta-language which would allow to properly addressing models and techniques migrating from other disciplines and codes.

We could argue that, having architecture's main scope passed from the mechanical era of design to the digital era of organization, this condition allows for the opportunity to expand the configuration of its models, borrowing and hybridizing from other disciplines, remaining 'disciplined' but not 'disciplinary'. This is valid also for the world of fashion.

Transdisciplinarity could give the possibility to merge successfully relational logics, material organizations, communication protocols, aesthetics, fields of applications and scales of production of disciplines as different as, for instance, the ephemeral, temporary, soft and fragile Fashion and the monumental, permanent, rigid and durable traditional Architecture.

The interstitial space of Transdisciplinarity ideas, will also allow the exploration of new sustainable concepts and practices. Present social-political aspects of Sustainability will be introduced in the form of Shelter provision for the users. Living in an information-rich environment poses questions of transferable shelters or in other words, reconfigurable adaptive structures, providing temporary shields or protection.

These ideas will be supported by an Up-cycled approach, encouraging a more responsible social-environmental behaviour. In addition to the use of re-cycled materials, we will aim to transform by-products and waste materials into new materials or products of better quality or improved environmental value, essentially a waste-free process.

The Workshop

We will aim to create a range of material cartographies, installations and objects with architectural qualities borrowed and hybridized by the material and organizational logics and properties of the fashion world.

These material cartographies will be some sort of cyborgian hybrids, 'part clock, part swarm balancing in the fulfilment of their tasks some control for some adaptability' , negotiating linear and non linear systems within their realms.

The end result is aspiring to be a one-to-one scale architectural fabric construct or / and in transition to a wearable structure, which will aspire for users' interaction. The students will design a modular system, which can perform and be flexible to all scales, can embody diversity of body movement and yet can perform as a fixed structure, at a shelter scale. The design process will include geometrical explorations, as well as assembly methods and modular systems emerging from both Fashion and architecture.

The modular system will aim to bridge the two disciplines, combining natural materials / ready made fabrics with digitally fabricated components. We will aim for minimum material to construct a structurally sound installation, which embeds resilient properties, as well as aesthetic values.

Methodologies and Techniques

To begin with students will explore ideas in pairs, then divide into two groups according to their field of interest, whether it is the structural aspect, the fabric texture or the material organisation. Eventually, the students will work in a collaborative manner, aspiring for one collective design, which will be built in a jointly selected site in the city of Brussels. The course will act as a testing laboratory, ideas sharing and mutual learning processes.

At a first phase, the students will familiarize with new digital design and fabricating techniques and in parallel, will test their idea in physical models, prior to final fabrication. More specifically, new relational domains will be researched and applied with both innovative (3D modelling, printing, coding, laser cutting) and carft techniques (folding, weaving, printing, draping, wrapping).

The innovative tools of computation in conjunction of digital fabrication allow the research of smart geometries and smart materials. The digital workflow allows to model design options on digital representations of body geometry and take advantage of form finding processes to simulate fabric behaviour. The body geometry becomes a source of information, that can allow to read inbuilt data and use them as input for the design iterations. With the use of computational tools students will be able to explore geometrical components and patterns behaviour through several quick iterative studies to then inform the analogue workflow. Complexity becomes therefore more controllable and design intent can be easily modelled, scripted and materialised.

Digital Fabrication technologies will be integrated within the overall workflow to translate information from the digital environment into the physical realm. The use of robotic fabrication, largely experimented at the architectural scale, gives the opportunity to augment traditional couture translating digital geometry in a fabricated product. Hand crafted techniques can be therefore combined with the accuracy and high resolution allowed by the use of robotic fabrication.

At a second phase, the students will study the geometries, which will allow for a construct to be self- supporting, regardless its scale. A study of a small unit populated in a differentiated manner as a surface will be explored, whether it is a wearable fabric or a shelter. In parallel, a location will be searched for and a material research will take place.

The Students will be encouraged to explore several materials, which can perform as a structural material as well as a wearable fabric/construct. We will search for local materials in existing factories or workshops, seeking to explore materiality from both industries and we will aim for efficient methods of using the material (no waste or using the waste).

The importance of avoiding waste in the city will be introduced as well in the packaging strategy, meaning all designed final objects will have to embed a dismantling strategy. The use of recyclable or, as previously mentioned, waste materials will be encouraged. Lastly, we will intent to find a method to construct and dismantle the construct in order to allow for re-installation in future locations. The final design will be then fabricated, ensemble on site and then dismantled before the end of the workshop.

COORDINATOR: DAVID ERKAN

Textile Architecture Biographies

ALDO SOLLAZZO

Aldo is a technologist, with expertise in robotics, manufacturing, and computational design. Since 2011, he is the director of Noumena, leading a multidisciplinary team towards the definition of new design strategies informed by tech-driven applications.He is also the Director of Reshape – digital craft community, a distributed platform promoting cutting-edge ideas merging design and manufacturing.At IaaC, Institute for Advanced Architecture of Catalunya, he is directing the Master in Robotics and Advanced Construction, focused on the emerging design and market opportunities arising from novel robotic and advanced manufacturing systems.In the same institution, Aldo is also directing the Global Summer School, since 2015.Aldo has been part of the Fab Academy program as a mentor of Fab Academy Paris and Frosinone from 2015 to 2017.In 2018 Aldo has received, from the Italian President of the Republic, the title of Knight of the Order of the Star of Italy for the promotion of national prestige abroad as a recognition of his scientific and technological activities

LAURA CIVETTI

Laura Civetti is a Fashion tech designer graduated from Interior Design at IED (Istituto Europeo di Design), in Milan. Interested in the new scenarios between the emerging technologies and fashion innovations, Laura attended a course at Central Saint Martins School in London and did her internship at Iris Van Herpen Atelier in Amsterdam. In the 2018, Laura graduated at Fabricademy Barcelona and Since 2016 she working at Noumena |design research education s.l., where she currently leads the Fashion tech area and is Coordinator of Reshape - design platform.

FLORENCIA AREZZO

Florencia Arezzo is a Designer working with digital tools for the apparel industry. Graduated from Fashion and Textile Design at UM (Buenos Aires) she was always attracted to sustainability. In 2019, after working for a few years in the field she decided to update her skills with a Master in Design, Technology and Innovation in Fashion as a need for professionals to propose innovative and sustainable solutions in multidisciplinary environments. Actually, she is working in Noumena as a Fashion Tech designer focused in digital softwares and computacional design.

Iaac institute for advanced architecture of Catalonia BARCELONA

ALDO SOLLAZZO

MRAC Director / GSS Director / MAA & CIEE Senior Faculty / Computational Expert / MaCT Seminar Faculty

Aldo Sollazzo is an architect and researcher, an expert in computational design and digital fabrication. Master in Architectonic Design in 2007, Master in Advanced Architecture at IAAC in 2012, Fab Academy diploma in 2014 in the Fab Lab Barcelona, Aldo is currently involved in several projects running in parallel. Since 2011, he is the manager of Noumena, a firm embracing data-driven design, investigating between the boundaries of new digital paradigms and design strategies applied to architecture, robotics and fabrication, through a hands-on and experimental approach.

He is also the founder of Fab Lab Frosinone and Director of Reshape, a digital platform promoting interdisciplinary and collaborative approach, towards the definition of new cutting-edge practices and disruptive ideas in the field of wearable tech and fashion design. Since 2015 he is faculty at IAAC, covering the positions of Director of IAAC Global Summer School, co-Director of the new Master of Robotics and Advanced Construction, and instructor of digital tools.

He is one of the Supernode of Fab Academy, the educational platform founded by Neil Gershenfeld from the MIT's Center of Bits and Atoms. For the same programme, he is also a local coordinator for Fab Academy Paris.

https://www.youtube.com/watch?v=fRKySeb3Fk8&feature=emb_logo

https://www.youtube.com/watch?v=EuH4FE6upOg

COORDINATOR: DAVID ERKAN

L A U R A C I V E T T I

BIO

Laura Civetti is a Designer focused on design-driven by data and digital manufacturing applied for the fashion industry.

Graduated from Interior Design at IED (Istituto Europeo di Design), in Milan (2012-2014) with thesis research on Eco-Yacht design, she soon shifts her curiosity in the new scenarios between the emerging technologies in the fashion industry. In 2016, Laura attended a Fashion course at Central Saint Martins School in London and did her internship at Iris *Van Herpen Atelier* (https://www.irisvanherpen.com/) in Amsterdam. In 2018, Laura graduated at Fabricademy Barcelona and work at *Materfad-Centre de materials de Barcelona (http://es.materfad.com/)* as a Material researcher. In 2017, she joined *Noumena* as head designer for the Fashion tech area and as Coordinator of *Reshape – design platform.* (https://youreshape.io/)

FOLLOW

Instagram @lauracivetti (https://www.instagram.com/lauracivetti/?hl=en)

Linkedin (https://www.linkedin.com/in/laura-civetti-574833b6/?originalSubdomain=es)

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Textile Architecture:

Design, Computation & Fabrication

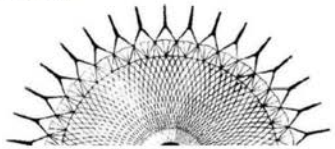
Methodologies

Samples

Diagrid

Pier Luigi Nervi

Junya Watanabe AW15

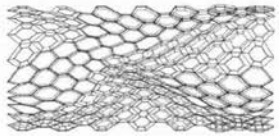


Pier luigi Nervi

Honeycomb

Exhibition stand with an irregular honeycomb MDF structure
Institute for Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart

Winde Rienstra Collection

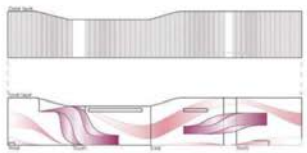


RedRoderigo Medina

Pleats

UN STUDIO_Galleria Center City

Issey Miyake. Shot by Herb Ritts, 1989

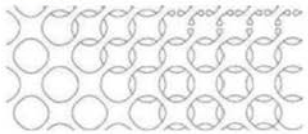


Galleria Center City facade drawing

Weaved chain

Erwin Hauer wall pattern

Threeasfour Biomimicry collection 2016



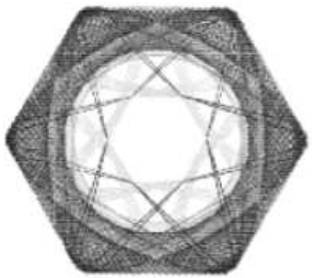
Erwin Hauer drawings

COORDINATOR: DAVID ERKAN

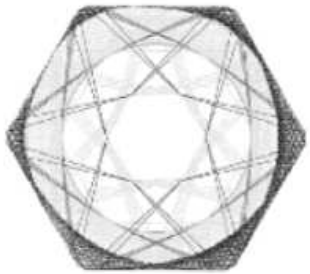
Weaved Strings

V&A Elytra Filament Pavilion_ University of Stuttgart

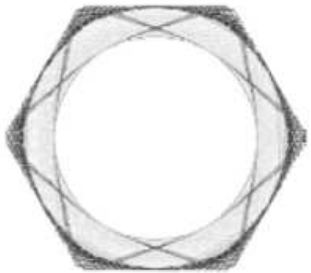
Gregory Phillips_ Guilloche cuffs



C25_Small Aperture
0.H,1.H,2.H,3.H,4.H,5.H
Fibers Length 3.05 km, 65 kg



C32_Medium Aperture
0.M, 1.M, 2.S, 3. L, 4.M, 5.L
Fibers Length 1.97 km, 42 kg



C13_Large Aperture
0.L,1.L,2.L,3.S,4.S,5.M
Fibers Length 1.64 km, 35 kg

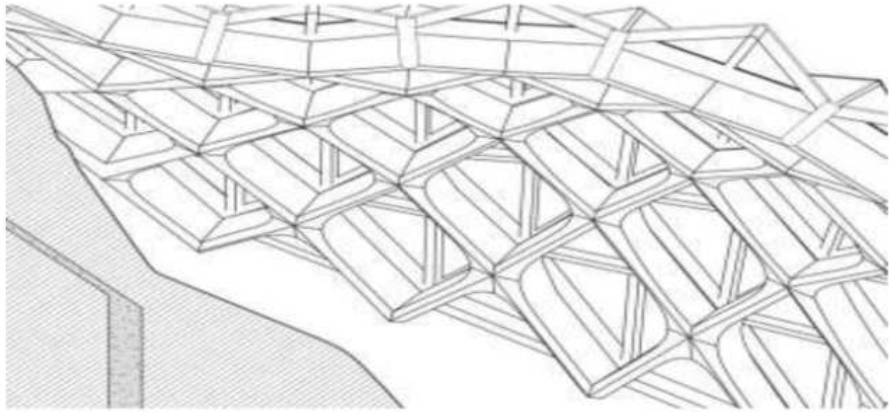
V&A Elytra Filament Pavilion_
detail drawing

COORDINATOR: DAVID ERKAN

Tetrahedron

MAD Harbin Opera House

Amila Hrustic collection



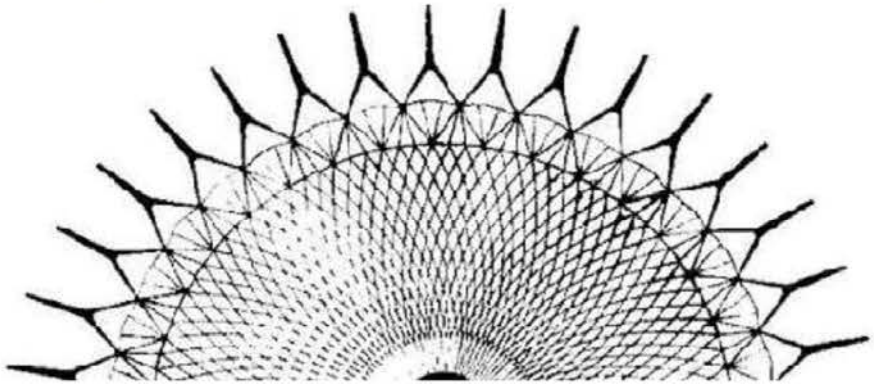
Harbin Opera House_drawing

COORDINATOR: DAVID ERKAN

Diagrid

Pier luigi Nervi

Junya Watanabe AW15



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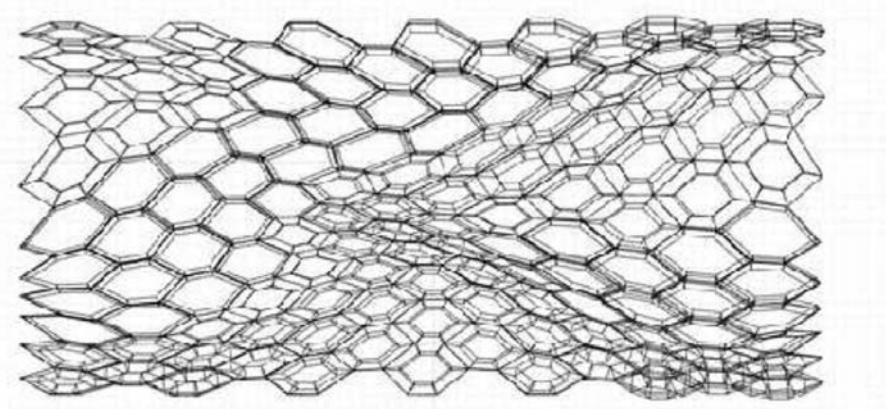

RodRoderigo Medina

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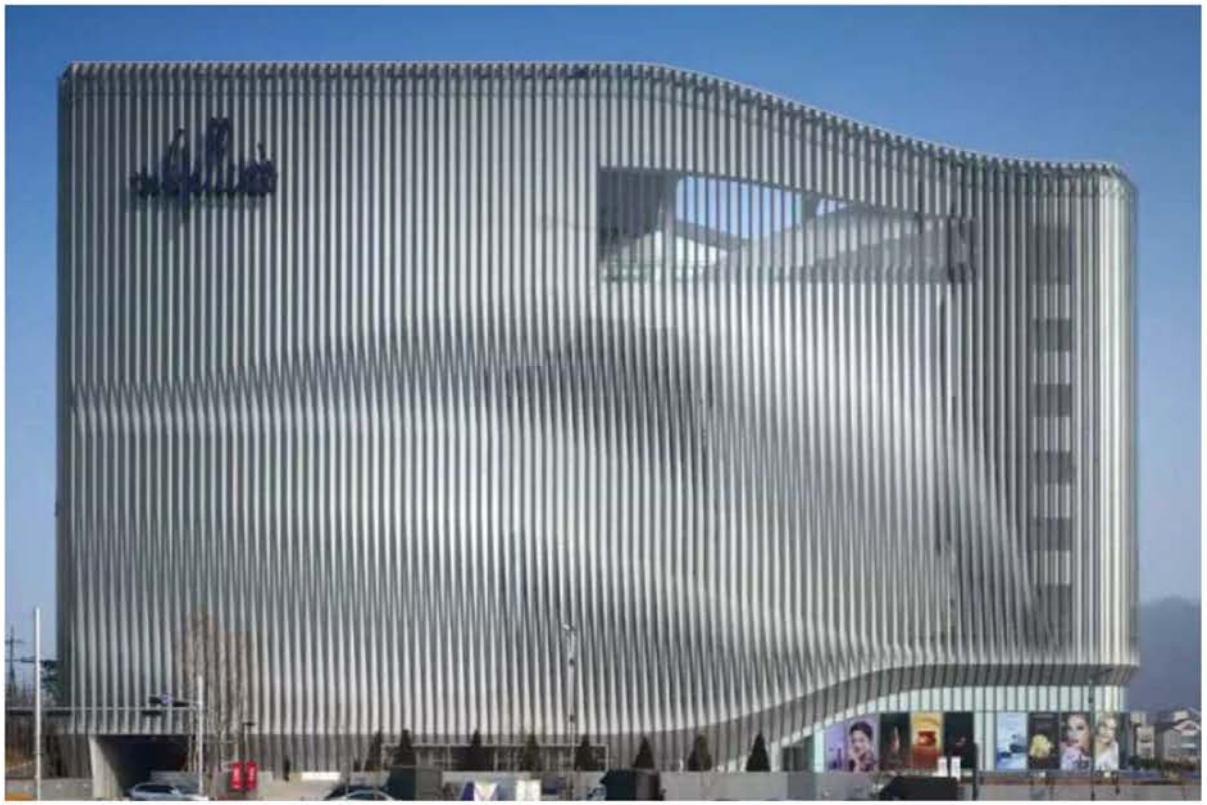
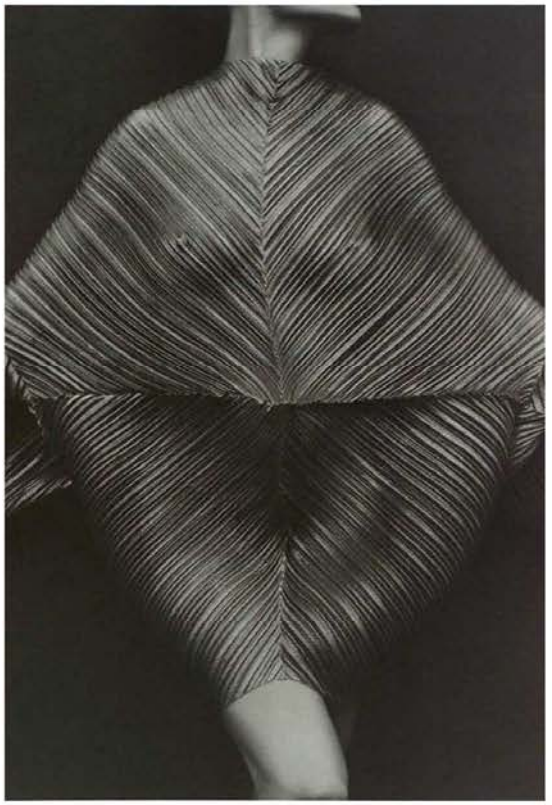
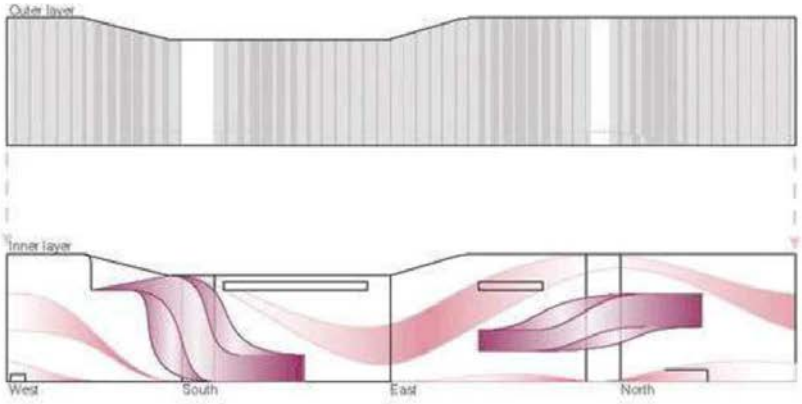
Pleats



UN STUDIO_Galleria Center City



Issey Miyake. Shot by Herb Ritts, 1989



Galleria Center City facade drawing

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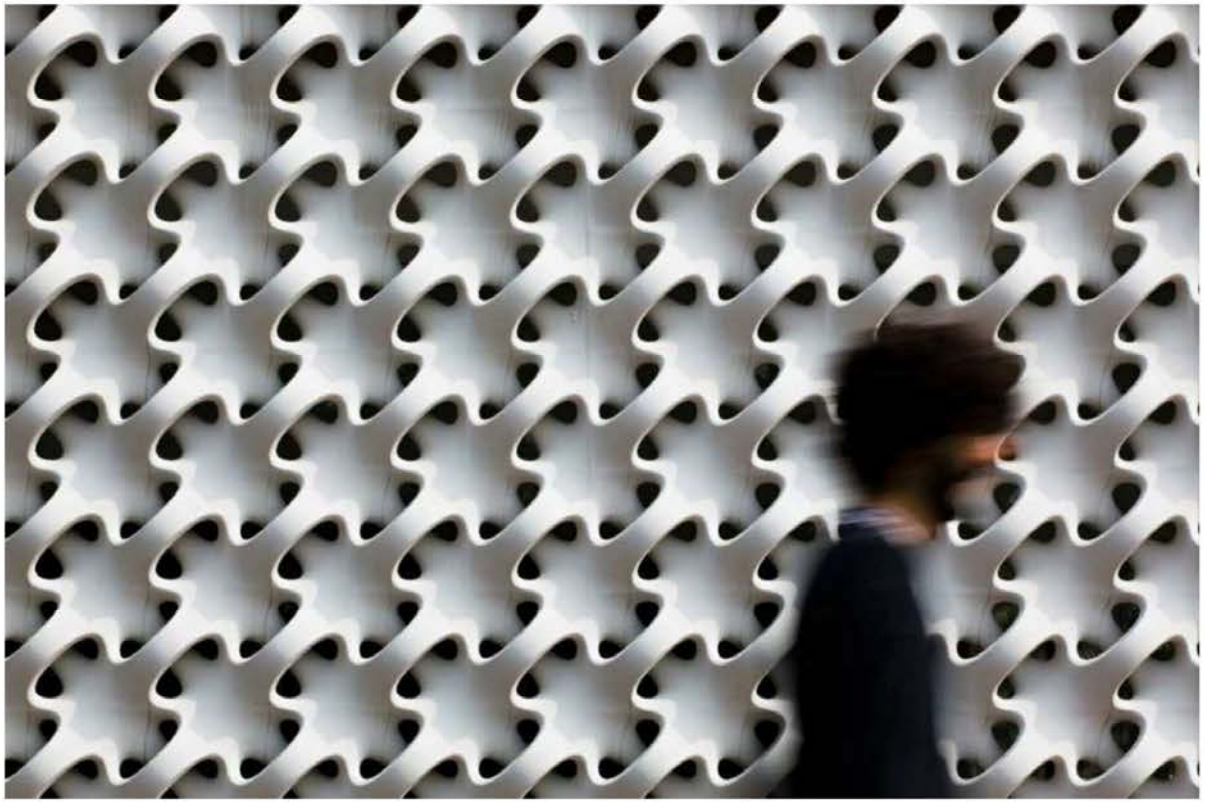
Weaved chain



Erwin Hauer wall pattern

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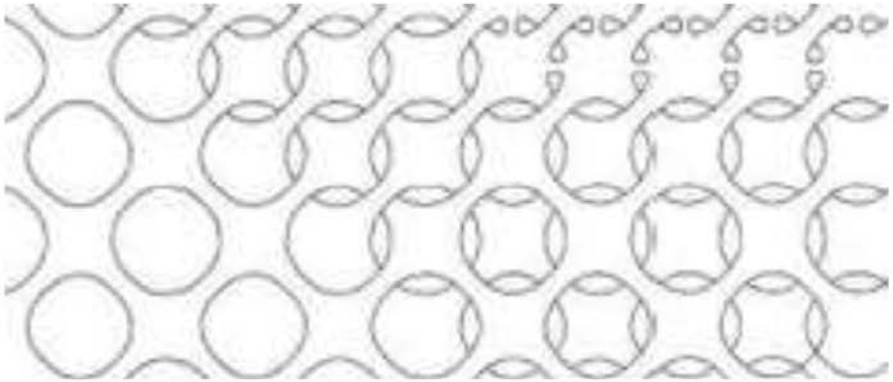

Erwin Hauer drawings

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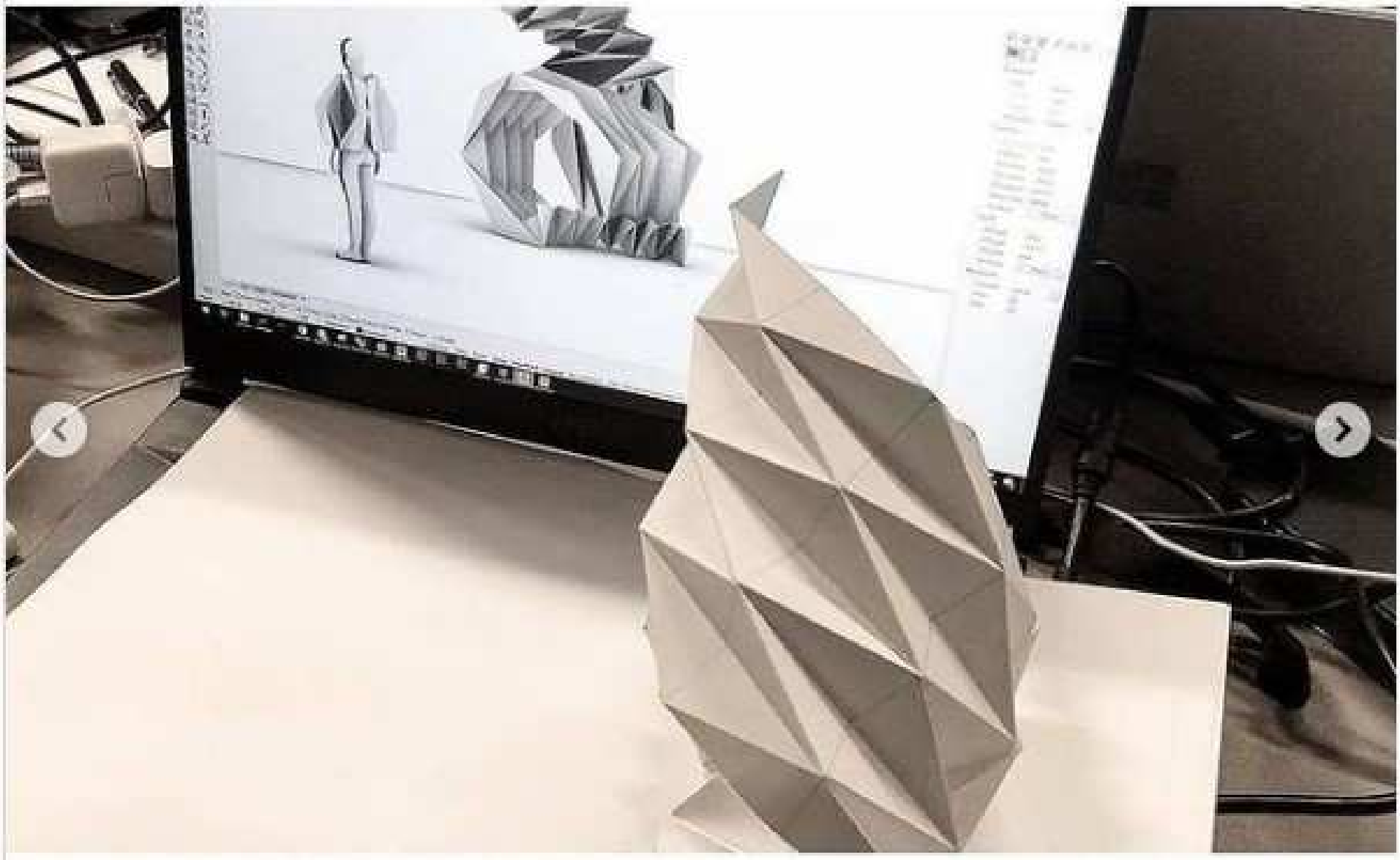
Examples



Examples

COORDINATOR: DAVID ERKAN

Examples

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Examples

Textile | Architecture International Workshop schedule

DAY 1

INTRODUCTION LECTURE|
Programme heads

The introduction lecture to Textile Architecture Workshop will elaborate on the new relationships between Architecture, Fashion design and resilience, exploring advanced computational skills, digital fabrication and simulation techniques combined with traditional craftmanship technique theories. The lecture will introduce the theoretical thinking behind transdisciplinarity while revealing the course objectives and the associated topics, which students will be exposed during the workshop.

DIGITAL TUTORIALS | Tutors_

Rhino Tutorials

1. Intro to Rhino and interface
2. Modelling fundamentals
3. Rendering fundamentals
4. Data exchange & Design workflow.

PROJECT INTRODUCTION | Programme heads
Students divide into groups and begin to develop their proposal

REVIEWS
By Programme heads and Tutors.

DAY 2

DIGITAL TUTORIALS | Tutors_

Grasshopper Tutorials

1. Grasshopper interface
2. Data structures
3. Geometrical morphing
4. Pattern on meshes.

PROJECT Development | Students

REVIEWS
By Programme heads and Tutors.

DAY 3

DIGITAL TUTORIALS | Tutors_

Crafts Tutorials

1. Lecture on craft, 3D textile manipulation and the heritage of textile craft in contemporary practices.
2. Pleating introduction
3. Demonstration and sampling stage 1
   (Accordion pleating, chevron & variations, tubular & variations).

PROJECT Development | Students

REVIEWS
By Programme heads and Tutors.

Textile | Architecture International Workshop schedule

DAY 4

DIGITAL TUTORIALS | Tutors_

Crafts Tutorials

1. Introduction to smocking & draping.
2. Demonstrations and sampling stage 1
   (chevron like patterns, lozenge patterns)

DIGITAL TUTORIALS | Tutors_

PROJECT development

1. Material behaviour modelling and simulation
2. Design modular typologies
3. Understand body scale.
4. Design overall garment geometry
5. Run iterations of design.

EVENING SESSION | Lecture Urban Symposium by Aldo Sollazzo_Noumena/ IAAC

DAY 5

DIGITAL TUTORIALS | Tutors_

PROJECT DEVELOPMENT and FABRICATION

1. Run iterations of design
2. Fabrication strategy
3. Geometry rationalization
4. Digital prototyping.

SKILLS TUTORIALS | Tutors_

Crafts tutorials

1. Introduction to scale
2. Introduction to ergonomics
3. Testing and sampling on human scale
4. Discussion about findings and challenges
5. Relationship to digital craft.

REVIEWS
By Programme heads and Tutors.

DAY 6

SIMULATION | RENDERINGS |INSTALLATION

DIGITAL FABRICATION | Tutors_

1. Run iterations of design
2. Fabrication strategy
3. Geometry rationalization
4. Digital prototyping.

DIGITAL FABRICATION & SIMULATION | Tutors_

COORDINATOR: DAVID ERKAN

1. Digital fabric manipulation of final pieces in conjunction with digital production.

INSTALLATION & SIMULATION

1. Testing the integration of digital and craft.
2. Testing the final installation

DAY 7

SIMULATION | RENDERINGS |INSTALLATION

DIGITAL FABRICATION & SIMULATION | Tutors_

1. Digital prototyping.

CRAFT FABRICATION & SIMULATION | Tutors_

Crafts tutorials

1. Digital fabric manipulation of final pieces in conjunction with digital production.

INSTALLATION & SIMULATION

1. Testing the integration of digital and craft.
2. Testing the final installation
3. Assembling of final design and exhibition

REVIEWS

By Programme heads and Tutors.

DAY 8

FINAL GROUP PRESENTATIONS

1. Final jury and presentation of projects studies
2. Workshop closing.

EVENING SESSION | Closing Lecture Urban Symposium by tbc.

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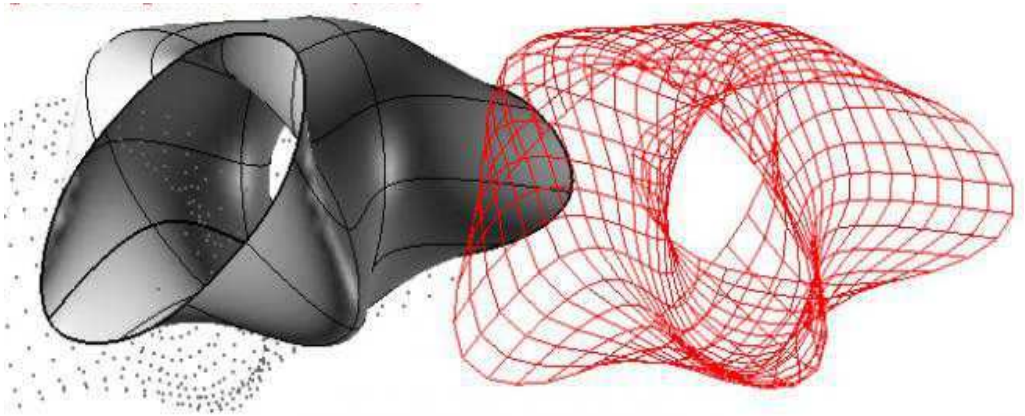

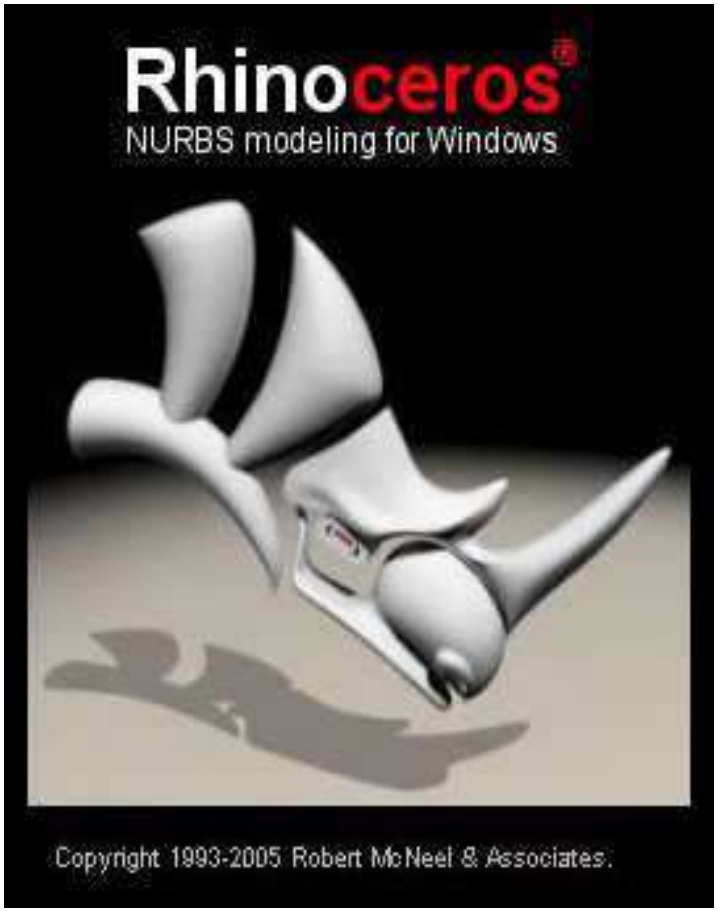

DIGITAL FABRICATION WORKFLOW
CAD / CAM / CAE & LAD

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