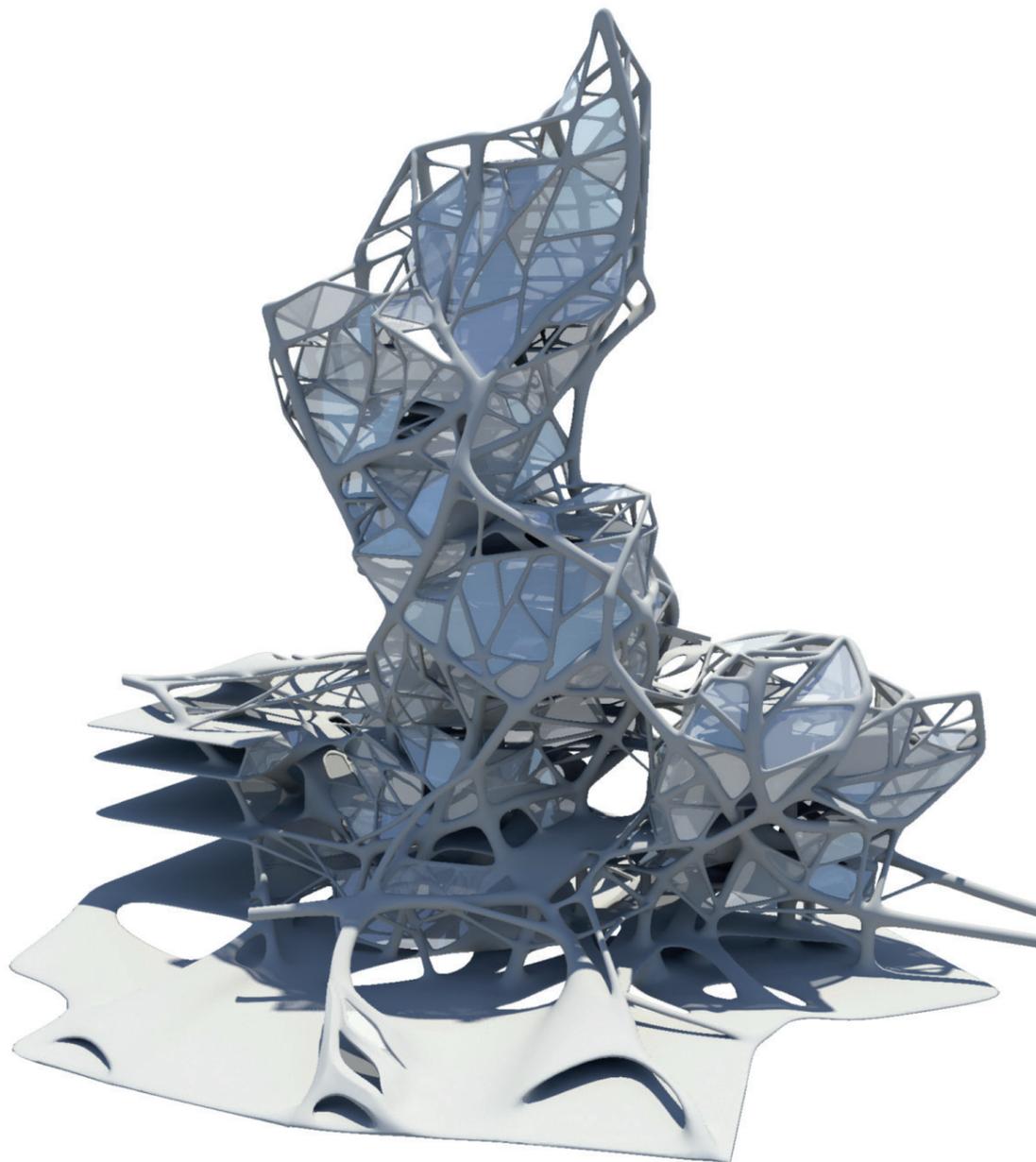


# HYPERBODY

NON-STANDARD & INTERACTIVE ARCHITECTURE



# HYPERBODY

Hyperbody is a research group at the Faculty of Architecture at the Delft University of Technology directed by prof. ir. Kas Oosterhuis. The goals set for the group's research are to explore techniques and methods for designing and building of non-standard, virtual and interactive architectures. Cutting edge techniques and methods are taught and applied by researchers and students. Designed and prototyped programmable buildings illustrate the paradigm shift from animation towards real-time behaviour. Hyperbody introduces interactivity not only in the process of collaborative design, but also during the use and maintenance of buildings. Hyperbody looks at all stages of the lifecycle of buildings and at the economical and ecological consequences, focusing on the development of new ideas and practical applications for interactive architecture. This leads to emergence of pro-active building bodies which act in a changing environment.

Apart from various prototypical installations and many case study projects, Hyperbody develops protoSPACE, a vehicle for transdisciplinary research, education and design in form of a virtually augmented transaction space. protoSPACE has been installed at the Delft University of Technology. In this research laboratory for collaborative design & engineering in real-time we explore the possibilities of multidisciplinary architectural and urban design in an ICT-driven environment, including new interaction modalities for intuitive control of the entire system.

# ONL [OOSTERHUIS\_LÉNÁRD]

Hyperbody is the research bureau established by Prof Kas Oosterhuis at the Faculty of Architecture at the TU Delft, as the research counterpart of his architectural practice ONL [Oosterhuis\_Lénárd] in Rotterdam. Inspired by recent development in the arts, Oosterhuis and Lénárd developed an interactive installation at the Venice Biennale in the year 2000. This project Trans\_Ports formed the basis of all further research and education at Hyperbody. The word Hyperbody was coined especially for this purpose. First of all, according to Oosterhuis, we need the body as a vehicle to go places. Places in the real world, augmented by places in the virtual domain. The body becomes a Hyperbody when all building components establish an interactive relationship to each other, to the surrounding environment and to the users inside the body. The building body becomes an instrument for the users to play with, a place to negotiate, a space to perform transactions, the hyperbody is a platform for participation.

# PROTOSPACE

The protoSPACE 3.0 laboratory is an initiative of Prof. Ir. Kas Oosterhuis, is developed by Hyperbody at the Delft University of Technology as a revolutionary real-time collaborative design environment. Located in the Faculty of Architecture at TU Delft, protoSPACE 3.0 is a unique, state of the art multi-purpose facility designed for the development of non-standard, virtual, and interactive architecture. In this initial phase protoSPACE 3.0 is built up of several components that facilitate 1-to-1 file-to-factory production, ubiquitous sensing, and immersive content presentation. In this initial phase, protoSPACE 3.0 consists of two main divisions that facilitate the research and education being carried out in the lab, the Interactive Experimentation Lab and the CNC Division. The Interactive Experimentation Lab refers to the ubiquitous sensing and immersive content presentation space within the first part of the lab. The Interactive Experimentation Lab is dedicated to the development and exploration of tools and scenarios in interactive architecture. An evolving system, the Interactive Experimentation Lab currently consists of a multichannel immersive audio system, a multiscreen projection system, and a dynamic sensor space, which is intended to be modular in order to facilitate the various current and unanticipated future research projects being carried out in protoSPACE 3.0. Nestled in the back of protoSPACE 3.0, the CNC Division is a laboratory for digital manufacturing. The activities of the CNC Division are supported by a specialist in the field of computationally advanced techniques for design and manufacturing. Equipped with a laser cutter and a large CNC mill, the aim of the CNC Division is to support design research activities with a special emphasis on experimentation in contemporary data-driven manufacturing methods and their integration into the design process.

The combined functionality and activities of the Interactive Experimentation Lab and the CNC Division indicate the primary research agenda protoSPACE 3.0 is designed to facilitate. As a research facility dedicated to the development of nonstandard, virtual, and interactive architecture, protoSPACE 3.0 facilitates the continuum between these domains via collaborative research design systems (protoBIM), the development of embodied interactive architectural components, file-to-factory design work flows, and non-standard geometries in architectural form. From scaled prototyping to 1-to-1 manufacturing of non-standard and interactive architecture, protoSPACE 3.0 is a platform for the development of innovative solutions for architectural design and production. ProtoSPACE 3.0 will be the vehicle for the Hyperbody education design and research courses, for both the Interactive Minor in collaboration with the Faculty of Industrial Design and EWI, and the Hyperbody Master track [Design, Compute and Perform]. Structural cooperation is scheduled between protoSPACE 3.0 and the Science Centre Delft, to show the results to a larger public.

# AFFILIATIONS

Hyperbody, as a cutting edge ICT driven research and design department, has over the years developed intricate academia and praxis based connections with some of the world's leading professionals, institutes as well as industrial practices. Some of our prominent connections include Marcos Novak (University of California, Santa Barbara, USA), EZCT (France), Servo (USA), ONL (Netherlands), Ayssar Arida (Q-DAR Development, architecture research, London), Antonino Saggio (University of La Sapienza, Rome), Neil Leach (Architect and theorist currently teaching at the University of Southern California), Chris Speed (Edinburgh College of Art), LABau (Belgium), Alisa Andrasek (Biothing, USA) etc.

Hyperbody has been instrumental in conducting a variety of workshops and lectures together with our international connections specifically focused on contemporary research and design approaches ranging from the product scale to the urban scale. These workshops thus provide researchers and students alike, the cutting edge knowledge and awareness pertaining to global initiatives in the field of computational design, analysis, new media, fabrication processes and socio-cultural dynamics. Equipped with this global outlook, our students find place worldwide in some of the most esteemed architectural design practices, thus maintaining Hyperbody's position as a critical research and education department.

# RESOURCES & COLLABORATIONS

## SCIENCE CENTRE DELFT

Hyperbody and the Science Centre Delft have initiated close cooperation. Science Centre Delft is the institution that acts as an interface between the Delft University of Technology and the general public. Its mission is to open up and share cutting-edge science and research of TU Delft with people of all ages and all social backgrounds. In this framework Hyperbody researchers and students work directly at Science Centre Delft. Its section functions as a lab where prototypes of interactive and non-standard architectures can be fabricated, assembled and tested, while at the same time they become immediately exposed to the curious public. Visitors to Science Centre Delft can meet researchers and students at work, help them with user-testing of developed prototypes and acquire understanding of this new kind of architectural environments.

## FESTO

Festo is Europe's leading supplier of pneumatic and automation components and systems. Festo promotes ideas and initiatives that go beyond the core business of automation and didactics, and may well give rise to promising areas of application in the future. Festo has been our research partner on the development of interactive architectures since 2003. The collaboration has resulted in the development of the

Muscle projects, our first prototypes of iA, in which we tried to emphasize the real-time actuated spatial response that a building or architectural space might provide. For the Hannover Messe 2009, the world's leading showcase for industrial technology, Hyperbody and Festo presented, an architectural-scale installation work, the InteractiveWall, with multi-sensory, real-time behaviours inspired by natural phenomena and triggered by internal and external stimuli.

## PHILIPS

Royal Philips Electronics of the Netherlands is a diversified Health and Well-being company, focused on improving people's lives through timely innovations. As a world leader in healthcare, lifestyle and lighting, Philips integrates technologies and design into people-centric solutions, based on fundamental customer insights and the brand promise of "sense and simplicity". In collaboration with ONL, Hyperbody developed iLITE, an installation commissioned by Philips, and part of the Transitions II – Light on the Move traveling exhibition, which highlights the architectural application of Philips' lighting systems. Philips Design and Hyperbody are collaborative working to extend the knowledge in the field of data visualization and information visualization, for purposes of personal healthcare data.

# ECODOMUS

Ecodomus is a multilateral European project that aims at putting together schools of architecture and enterprises for the exchange of research results, information, ideas, techniques, methods and expertise in the domain of design-to-manufacturing. Ecodomus focuses on the emerging technologies of F2F (file to factory) construction, which utilize CNC (computer numerically controlled) fabrication in conjunction with direct digital communication.

In 2008 and 2009 two Ecodomus workshops were held, in Lyon and Barcelona respectively, which allowed students to develop and realize their designs together with specialized clusters of local industries. The first funding period of Ecodomus concluded with the "F2F file to factory continuum conference" in Chania, Crete. The body of work developed at the workshops brought forth a traveling exhibition and will be on display at the 2010 Shanghai Expo. Future Ecodomus activities will be directed at the informed use of F2F technologies and their impact on sustainable building, as they improve a) environmental sensitivity of designs via non-standard production of unique forms highly optimized to their particular location; b) material performance via the precision manufacture of components; and c) impact and cost of procurement and production, by transmitting data rather than shipping bulk materials.

Maria Voyatzaki, of Aristotle University of Thessaloniki, Greece, coordinates CONTIUM, which 2010-13 will be followed up by ECODOMUS.

# HYPERBODY TEAM

## **Kas Oosterhuis** – The Netherlands

Born in 1951 in Amersfoort Kas Oosterhuis studied architecture at the Delft University of Technology. In 1987-1988 he taught as unit master at the AA in London and worked/lived one year in the former studio of Theo van Doesburg in Paris together with visual artist Ilona Lénárd. Their design studio is in 2004 renamed into ONL [Oosterhuis\_Lénárd]. As from 2007 Oosterhuis is a registered architect in Hungary, executing as General Designer the CET project. Since 2000, Oosterhuis has been appointed professor of digital design methods at the Delft University of Technology and he is currently leading a staff of twenty researchers at Hyperbody, the knowledge centre for Non-Standard and Interactive Architecture. Oosterhuis is Director of the protoSPACE Laboratory in the iWEB pavilion, located in front of the Faculty of Architecture. He is member of the Dutch Building Information Council and has been a Member of the Board of Witte de With Center of Contemporary Art in Rotterdam and of the VCA (Computer users Architectural Offices) until 1989. He has been the co-founder of the Attila Foundation, responsible for the groundbreaking Sculpture City event in 1994 and the ParaSite web-lounge in 1996. He has lectured worldwide at numerous universities, academies and international conferences since 1990. Oosterhuis has initiated two GameSetandMatch (GSM) conferences at the Delft University of Technology on the subjects' multiplayer game design, file to factory design and build methods and open source communication in the evolutionary development of the 3D reference model. Award winning building designs include the Saltwater pavilion at Neeltje Jans (Gold Award 1997 for innovative recreational projects, Zeeuwse Architectuurprijs 1998, nomination Mies van der Rohe Award 1998), the Garbage transfer station Elhorst/Vloedbelt in Zenderen (Business Week/Architectural Record Award 1998, OCE-BNA Award for Industrial Architecture 1996, Aluminium Design Award 1997) and the Hessing Cockpit in Acoustic Barrier in Utrecht (National Steel Award 2006, Glass Award 2006, Dutch Design Award for Public Space 2006, nomination Mies van der Rohe Award 2008, nomination Golden Pyramid 2006).

## **Hans Hubers** - The Netherlands

Hans Hubers is an associate professor, building engineer. He specializes in BIM, CAD and multi-media. Prior to joining the Hyperbody, he was managing director at Hubers Multimedia Delft and before that he was managing the Union of Computer Using Architects with 200 of the largest architectural offices in the Netherlands. His PhD dissertation is called Collaborative Architectural Design in Virtual Reality. He has become a specialist in programming real-time 3D design environments with database connections over the Internet.

## **Nimish Biloría** - India

Dr. Nimish Biloría is an Architect and an Assistant Professor at Hyperbody, Faculty of Architecture, TU Delft, The Netherlands. After being involved with investigating the inter-relation of Media and Architecture throughout his formative educational years at CEPT, Ahmadabad, India, he furthered his interests in the inter-disciplinary realm at

the Architectural Association, London, UK, where he specialized in the field of Emergent Technologies and Design. He further attained a Doctorate at the TU Delft, Netherlands, with a focus on developing real time adaptive environments. He continues experimenting with the idea of formulating intelligence aided relational networks for the generation of performative morphologies.

Dr. Biloría apart from his teaching initiatives at Hyperbody is also the Research Manager of Hyperbody and is involved with developing computationally enhanced performative & sustainable architectural and urban design solutions. He has conducted various seminars for the same and is a proponent of systemic design and bio-inspired performative design solutions. He, as a part of such research and design investigations specifically seeks a synergistic merger of the fields of computation, material systems, sensing technologies, environmental dynamics and social demographics. Dr. Biloría has lectured at prestigious institutes globally. He has also presented and published his research and design deductions in numerous international design conferences and magazines and has been a proponent for exchanging design-informatics oriented knowledge globally.

## **Henriette Bier** - Germany

After graduating in architecture (1998) from the University of Karlsruhe in Germany, Henriette Bier has worked with Morphosis (1999-2001) on internationally relevant projects in the US and Europe. She has taught computer-based architectural design (2002-2003) at universities in Austria, Germany and the Netherlands. Since 2004 she teaches and researches at TU Delft; her research focuses not only on analysis and critical assessment of digital technologies in architecture, but also reflects evaluation and classification of digitally-driven architecture through procedural and object-oriented studies. It defines methodologies of digital design, which incorporate Intelligent Computer-based Systems to not only support the design process but also actuate architecture. She initiated and coordinated (2005-07) the workshop and lecture series on Digital Design and Fabrication within DSD (Delft School for Design) with invited guests from MIT and ETHZ and finalized (2008) her PhD; results of her research have been published in books, journals and conference proceedings. She regularly lectures in Europe and US as well as leads EU-funded projects within Hyperbody and Border Conditions at TU Delft.

## **Marco Verde** - Italy

Marco Verde is an Engineer from UNICA, Università degli Studi di Cagliari (Italy). Marco earned his post-graduate Master's degree in Architecture (2005) and a DEA's degree (2008) at EsArq-UiC, Universitat Internacional de Catalunya in Barcelona. Marco is a specialist in contemporary design strategies and processes for Non-Standard Architecture; he is an expert in parametric-associative design and digital fabrication methods. From early 2005, Marco resided in Spain. Here he joined HYBRIDa (Sylvia Felipe + Jordi Truco Architects) where he worked as project manager, designer, and researcher. He was deeply involved in the HybGrid® research project: a patented, real-time responsive and adaptive structural system. From 2006, Marco taught within undergraduate, postgraduate design studios, and work-shops held at EsArq-UiC (Spain), Pratt Institute (USA), Elisava (Spain), University of Nicosia (Cyprus), AA Visiting School Paris (France), Politecnico di Milano (Italy), and Hyperbody (The Neth-

erlands). In fall 2008, Marco moved to The Netherlands to join Hyperbody. Here Marco currently holds a position as Assistant Professor within the Masters' degree program in Non-Standard and Interactive Architecture. Since 2006, Marco is member of the teaching staff at Ma(s)Lab (Material Systems Laboratory) and CoDeLab (Computational Design Laboratory) currently held at Elisava, Escuela Superior de Diseño in Barcelona. Marco is the principal of [P]a, Performative Design Processes for Architecture, a research initiative founded in early 2007. At the core of [P]a agenda is the interdisciplinary investigation of computationally advanced design techniques, material systems and material science, and data-driven fabrication methods. [P]a is internationally involved in architectural practice, teaching, research, and consulting.

### **MarkDavid Hosale** - United States

MarkDavid Hosale is a media artist and composer with a Ph.D. in Media Arts and Technology from the University of California in Santa Barbara (2008). As an interdisciplinary artist and com-poser MarkDavid has found that, beyond the common language of new media, the connecting tissue between various art practices and music can be found in narrative. In particular, the kind of narrative that is structured using nonlinear representations of information, time, and space. Non-linear narrative is an inherent aspect of new media that provides a common baseline whereby media artworks can be evaluated and understood. In addition to non-linear narrative, MarkDavid's interdisciplinary interest in art and music comes from the exploration of the connection between the physical and the virtual world. Whether as part of an installation work or performance work, the virtual spaces he creates are technologically transparent, sophisticated and virtuosic, as well as intuitive to experience and use.

### **Christian Friedrich** - Germany

Christian Friedrich was born in Germany. After studying Physics and Philosophy in Berlin and completing an architectural engineering degree at Hanzehogeschool Groningen, he finished his graduate education (MSc) in architecture at Delft University of Technology, Netherlands. He is the co-founder of the media artist collective Ezthetics. He has been associated with Hyperbody for four years, as student assistant, master student and researcher. His work with the HRG includes teaching Vrttools courses, conference lectures and developing the protoSPACE group design environment. During the last four years, he was involved in several projects of the architectural office of Kas Oosterhuis and Ilona Lenard, ONL. He is currently developing his PhD research project in which he intends to describe and actualize the architectural singularity: a point at which the architectural process loop is executed in real-time and shifts from a phased process into a behavioral network, in effect reshaping architectural praxis.

### **Tomasz Jaskiewicz** - Poland

Tomasz Jaskiewicz is an architect, urban designer, academic researcher and teacher. After finishing his undergraduate studies in architecture and urban planning at TU Gdansk in Poland, he joined the Hyperbody group at TU Delft in the Netherlands. There, in 2005, he obtained his Master of Science degree in Architecture, with a thesis on a real-time participatory urban planning toolkit "Paracity" and he worked as leading researcher on a series of "Protospace Demo" projects, investigating novel

applications of computational techniques and interfaces to participatory and collaborative architectural and urban design. In following years he joined the architecture firm ONL [Oosterhuis\_Lénárd] where he worked as architect and project manager, bringing much of his earlier studies to practice. In 2007 he has started his PhD research at TU Delft, in which, supervised by prof. Kas Oosterhuis, he focuses on the application of multi-agent models to creation of evolving interactive architectural ecologies. Next to his research, he also works as an academic teacher, most recently having initiated and coordinated the interdisciplinary undergraduate minor programme "Interactive Environments". In all his projects, Tomasz transgresses the boundaries between conventionally established disciplines and practices. He explores new paths leading towards creation of architecture becoming a complex adaptive system. In this way, he aspires to produce artificial spatial ecologies operating in a pro-active symbiosis with their human inhabitants and with the natural environment.

### **Han Feng** - China

Han Feng is an architect from China. After graduating from architecture department of Harbin Institute of Technology 2002, he has been working with L.A. International Ltd in Beijing. He obtained his Master of Science degree in architecture at Delft University of Technology, Netherlands (2003-2005). In 2006 he has been working with several design companies in Netherlands, including ONL [Oosterhuis\_Lénárd], De werff architectuur, ANT Architects and Studio 015. He is currently working on research within Hyperbody, TU Delft aiming at enriching architectural design with ideas and methods found in Quantum mechanics.

### **Jelle Feringa** - The Netherlands

Jelle Feringa is currently writing a PhD thesis, titled Design-by-Simulation, exploring the potential of simulation for architectural conception, at the Hyperbody Research Group, TU Delft. Jelle has taught and lectured at the ESA, Paris-Malaquias, ETH, and TU Delft. He is a founding partner in EZCT Architecture & Design Research. Projects have been exhibited at the Mori Art Museum (Tokyo, 2004), Archilab (Orléans, 2004), Barbican Gallery (London, 2006), Design Miami/Basel (Miami, 2007), Pompidou Center (Paris, 2007), Maison Rouge (Paris, 2007), Architectural Association (London, 2007), ScriptedByPurpose (Philadelphia, 2007) International Biennial of Sevilla (Sevilla, 2008), Vivid design gallery (Rotterdam, 2009). Early research results have recently been exhibited at the transNatural (Amsterdam, 2010) exposition. The work of EZCT is part of the permanent collection of the Pompidou Center and the FRAC Orléans collection. In 2007 the office won the Seroussi Pavilion.

Jelle's work is focused on the close coupling of advanced simulation methods with evolutionary computing methods. His academic research work is focused on the development of generative design representations. For his research work, Jelle relies on Open Source software. Working together Thomas Paviot, Jelle has been driving the development of an open source CAD framework, PythonOCC a CAD/CAE/PLM development framework for the python programming language.

### **Chris Kievid** - The Netherlands

Chris Kievid is a researcher at Hyperbody, a contemporary information technology

driven research and design group at the Faculty of Architecture of the Technical University in Delft. He graduated cum laude in architecture at the TU Delft in 2006. His thesis received a nomination for the Dutch Archiprix 2007. As freelance architect and interaction designer he has worked for the multidisciplinary design office ONL [Oosterhuis\_Lénárd] on a variety of innovative projects. As researcher and project manager at Hyperbody he has been responsible for the development of the design environment for immediate design and engineering: protoSPACE, the project iLite for the traveling road show Philips Transitions II and the InteractiveWall installation for the Hannover Messe. As coordinator and tutor he is involved the Hyperbody educational MSc 2 and minor program.

### **Xin Xia** - China

Xin Xia studied at the Nanjing Arts Institute for Decorative Art Design. In 2000, she moved to the Netherlands for postgraduate studies, where she completed master's degrees at both the Dutch Art Institute (Visual Art) and Amsterdam University (Film and Television Studies). Her practice was mainly in painting and installation. Her research was focused on Cognitive Film Theory and Contemporary Video Art Installations. She was involved with ONL [Oosterhuis\_Lénárd] on art projects and publicity. In 2005 she joined Hyperbody as a researcher. Besides working on course coordinating, protoSPACE Art projects coordinating and doing her research, she is mainly working on publications and publicity.

### **Veronika Laszlo** - Hungary

Veronika Laszlo moved to the Netherlands in 1987 and studied software engineering and artificial intelligence. She was working on many ICT projects for various companies involving tele-communications, networking, databases and web solutions. She joined Hyperbody as a programmer in 2008 and works on protoSPACE projects.

### **Owen Slootweg** – The Netherlands

Owen Slootweg has received his Masters degree from Delft University of Technology [1999-2007] with an honourable mention. During his student career Owen Slootweg worked for 5 years at the chair Technical Design and Informatics of the department of Building Technology, where he tutored other students and did several research and commercial projects. He worked with ONL [Oosterhuis\_Lénárd] from medio 2007 where on the architectural level his focus lied in creating parametric 3D models and he worked closely with the structural engineers to design and optimize building constructions. Combining his hobbies with his work Owen Slootweg has developed an extensive knowledge of the principles behind 3D modeling, software and programming and is greatly experienced with 3D-rendering and visualization, as well as several scripting languages involving 3D platforms.

### **Sander Korebrits** - The Netherlands

Sander Korebrits is a student at the Faculty of Architecture of the Technical University in Delft, working on his graduation project at chair Hyperbody. He has been a student assistant at Hyperbody as well, since 2003, where he started out giving Virtools

courses. His tasks soon extended into developing applications for several research and education projects. His interests in web applications, over time gave him proficiency in developing web applications using php, html, CSS, JavaScript, MySQL and Ajax. In 2007 he cooperated with a video artist in the Warum 2.0 project that focused on a web application interacting with a Max MSP patch, further developing his software skills.

### **Bao An Nguyen Phuoc** - The Netherlands

Bao An Nguyen Phuoc is a student and student-assistant at Hyperbody . Bao's graduation work is part of an ongoing research into an architecture which explores digitally driven strategies. This exploration, grounded in the repositioning of design processes, intents to rethink hierarchies within architectural design. Besides studying and working at Hyperbody, Bao works independently on several projects ranging from installations to interiors, sculpture and graphic design.

### **Maria Vera van Embden Andres** – The Netherlands

Maria is a graduate student at Architectural Engineering at the Building Technology department of the faculty of architecture. She was involved in the interactive portal project in spring 2008. And works as a student assistant for Hyperbody since September 2008.

## HYPERBODY GUESTS

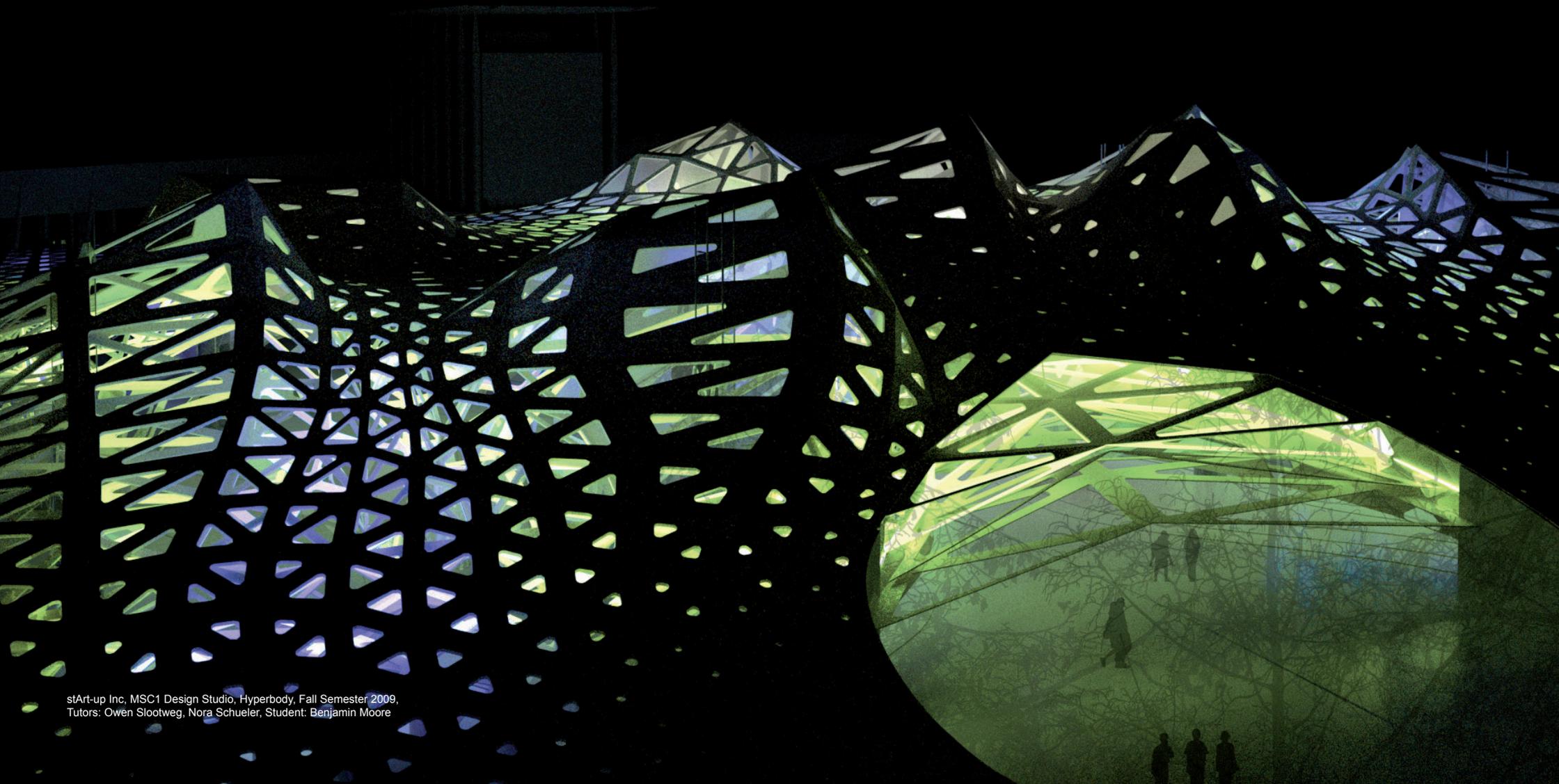
**Alisa Andrasek, Antonino Saggio, Axel Kilian, Ayssar Arida, Bert Bongers, Charl Botha, Christian Derickx, Daan Rooseg-aarde, Dan Overholt, EZCT, Gijs Joosen, Jelle Feringa, Jerome Decock, Jordi Truco, Jorik Blaas, LABau, Marcos Novak, Mario Carpo, Matias Del Campo, Neil Leach, ONL, Philippe Rahm, Ruairi Glynn, Servo, Tetsuo Tomiyama, Chris Speed.**

# BACHELOR & MASTER TRACKS

## NON-STANDARD AND INTERACTIVE ARCHITECTURE

Organized by the independently established Hyperbody chair the new MSc track in Architecture on Non-standard and Interactive Architecture [NS&IA] has been launched in September 2008. The main goal of the program is implementing innovative architecture with state-of-the-art material and information logistics. In this context, Non-standard Architecture (NA) is defined as an architecture that departs from modernist, repetitive, mass-production principles in order to address complexity, variation, and mass-customization. Furthermore, interactivity in architecture (IA) is addressed at the level where building components and buildings become dynamic, acting and reacting in response to environmental and user-specific needs. Students without prior computing and software knowledge may join Hyperbody design studios and workshops that introduce students at MSc 1&2 level to the basics of NS&IA, while advancing at MSc 3&4 level expertise in parametric and scripting-based design for NS&IA. Worldwide renowned guest lecturers and tutors are joining for both theoretically inspiring lectures and practical workshops to be hosted in protoSPACE. Furthermore, Rapid Fabrication and Prototyping sessions held in protoSPACE allow students to build either scaled models or 1:1 components of their projects. Students from all semesters participate in provided vertical-studio activities, allowing for exchange of knowledge and experience between different student groups. Additionally, special shared activities are organized in connection to the newly formulated Interactive Components Minor, organized in close cooperation with the faculty of Industrial Design.

# MSC 1



# HYPERBODY MSC 1

## DS1 SWARM ARCHITECTURE

Design Studio 1

Code AR1AUE010

Course Title Interactive Urban Inserts

Credit points 12

Coordinator Ir. Han Feng

Tutors Dr.-Ing. Henriette Bier, Ir. Han Feng

Hyperbody's MSc 1 studio proposes the development of urban inserts that incorporates interactive interfaces and, possibly, sensor-actuator or robotic devices. Rotterdam and, perhaps, Beijing are seen as larger urban environments for investigating and designing placement and operation of such urban inserts that communicates via Internet with external databases and users. This system of interactive urban inserts is distributed within a larger urban context and operates like a swarm in such a way that inserts are communicating with each other and users via Internet, as well as change behavior according to environmental and user specific needs. Architecturally seen, urban inserts may be middle-scale buildings such as information and transportation hubs, exhibit pavilions.

The studio is supported by lectures and workshops that allow students to not only understand notions such as Non-standard and Interactive Architecture (see general introduction to education program NS&IA by H. Bier) but also develop computer and design skills for Rhino 3D modeling and Grasshopper parametric design. Furthermore, workshops introducing methodologies for Computer Numerically Controlled fabrication (CNC) enable students to manufacture and assembly one or more pieces of urban inserts. Interactivity may be employed at the level where embedded webcams, movement and touch sensors, as well as multi-media interfaces may be activated once people start approaching and using such pieces of urban furniture allowing for some level of response, which is translated into image, sound and/or kinetic change.

## AS1

Architectural Studies 1

Code AR1Aue020

Course Title Architectural Studies 1,  
an introduction into modeling and fabrication

Credit points 3

Coordinator Ir. Jelle Feringa

Tutors Ir. Jelle Feringa

The Architectural Studies 1 (MSc1) course introduces students to a computational approach of architectural design. A series of workshops prompts students towards an understanding of computational design strategies, methodologies and tools. These workshops bring student up to speed in terms of modeling, programming and fabrication skills, which

are needed to successfully complete the Design Studio. Workshops consist of architectural design exercises that can be completed within 2,5 days. This hands-on, intensive approach allows students to build skill and confidence in short periods of time. Specific design problems that have filtered through from the Design Studio Projects are zoomed in upon; a way of inserting domain expertise of the workshop tutors into the studio projects.

## MS1

Media Studies 1

Code AR1Aue070

Course Title Media Studies 1 with New Media

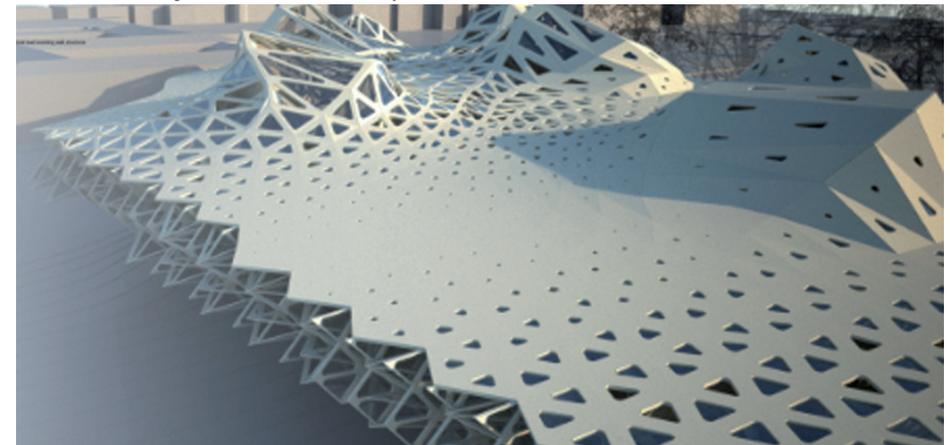
Credit points 3

Coordinator Dr. MarkDavid Hosale

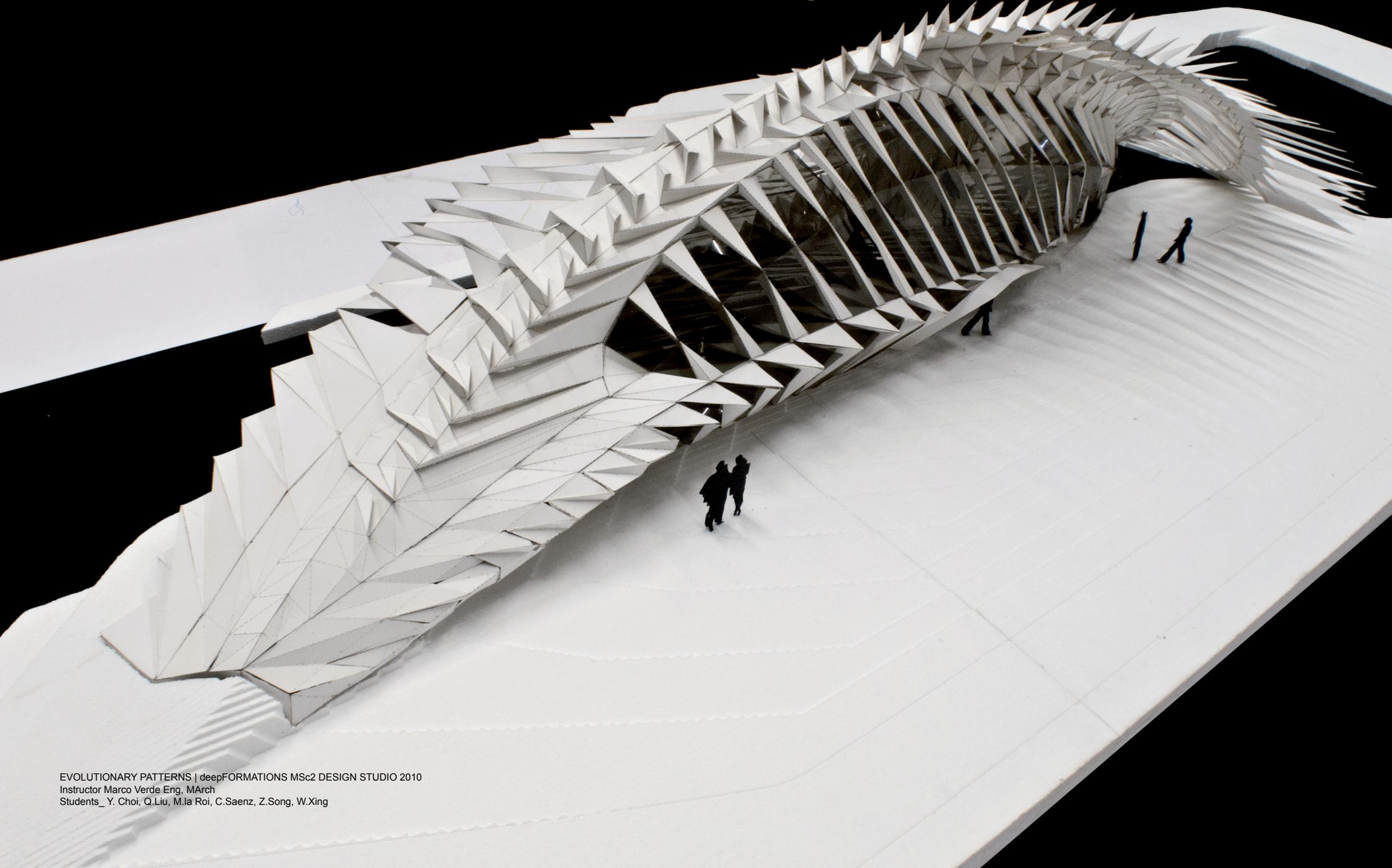
Tutors Dr. MarkDavid Hosale

The primary content of this course will be presented in a series of themes that provide the basis for the exploration of the theory and praxis of media art. This exploration will be conducted using fundamental tools needed for the analysis, evaluation, and creation of interactive media art works. The exploration of media art will provide a window into the characteristics unique to digital media and the bidirectional affect of digital media on contemporary culture. The culmination of this exploration will result in the development of an interactive and immersive virtual architecture built on the foundation of an informed praxis of media art. In the context of Hyperbody this exploration is readily connected to the study of non-standard, virtual, and interactive architecture as an interactive system and an expression of the contemporary understanding of the structure of knowledge and nature as a nonlinear form.

stArt-up Inc, MSC1 Design Studio, Hyperbody, Fall Semester 2009,  
Tutors: Owen Slootweg, Nora Schueler, Student: Benjamin Moore



# MSC 2



EVOLUTIONARY PATTERNS | deepFORMATIONS MSc2 DESIGN STUDIO 2010  
Instructor Marco Verde Eng, MArch  
Students\_ Y. Choi, Q.Liu, M.la Roi, C.Saenz, Z.Song, W.Xing

# HYPERBODY MSC 2

Design Studio 2

Code AR0850 / AR0855

Course Title Evolutionary Patterns

Credit points 12 / 12

Coordinator Marco Verde Eng, MArch

Tutors Marco Verde Eng, March

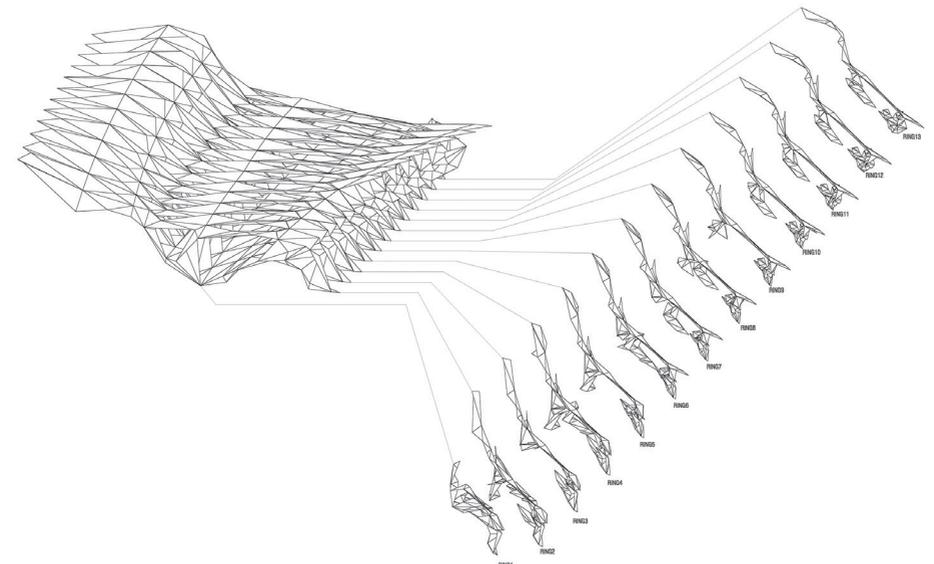
Computational technology is ubiquitously spreading across all fields of industrial production and deeply changing designers' approach and processes. Novel opportunities proceed from a computational approach, but especially in the architectural domain, a gap among new design possibilities and actual production is increasingly rising. In general, actual innovation of architecture is hampered by a conservative project practice, which is based on fragmented processes and traditional building technology. Hence, although the architectural domain partially adopted digital technologies in computer-aided processes, this engagement frequently turned into a simplistic technical upgrade of routines, not always into the pursuit of new strategies and results.

In contrast, one of the main challenges of a computational approach to architectural design is defining new strategies to maintain consistency from design to materialization. Especially the understanding of design and its materialization as feature of a unique process becomes a central issue. In fact, through the pursuit of an integral understanding, the customary fragmented project practice can be replaced by an interactive, non-linear process that blurs the boundaries among disciplines. Such move requires a solid understanding of not only computational design methods, but also a robust research in material science and contemporary data-driven manufacturing methods.

Rooted in the concepts introduced, Evolutionary Patterns Design Studio aims a holistic understanding of architectural design through a research driven approach. Through investigations in computational generative design strategies, the course aims at exploring process of automatic form generation via advanced simulation techniques. Accordingly, aim of course is not to define final objects, but to develop processes and systems that are responsible of fields of multiple spatial opportunities. The generated formations are studied as integral bodies which differentiated spatial organization is catalyst of spatial, tectonic, manufacturing, and performative features. The understanding of the inherent architectural potentialities and the further development towards a solid possible future are main aims of the course. During the course, students will develop in-depth investigations in computationally advanced design strategies and physical proto-

typing, which will be crucial instrument for a solid development of the computer-based design-research. Final aim of the course is the CNC production of large-scale / 1:1 scale prototypes. During the course, students will develop strong expertise in advanced parametric-associative design strategies and digital fabrication techniques. Finally, students will learn how to inform the design by the production methods, and how to develop integral design strategies while embracing the entire process of production from design to final materialization.

EVOLUTIONARY PATTERNS | deepFORMATIONS MSc2 DESIGN STUDIO 2010  
Instructor Marco Verde Eng, MArch  
Students\_ Y. Choi, Q.Liu, M.Ia Roi, C.Saenz, Z.Song, W.Xing



# MSC 3/4



# HYPERBODY MSC 3 / 4

DS 3 / 4

Design Studio 3 / 4

Code AR3Aue30 / AR4AU200

Course Title Formations / Embodiments

Credit points 15 ECTS / 20 ECTS

Coordinator Dr. Nimish Bioria (MSc 3) / Dr.-Ing. Henriette Bier (MSc 4)

Tutors Dr. Nimish Bioria, Ir. Jelle Ferringa (MSc 3) / Dr. Nimish Bioria,

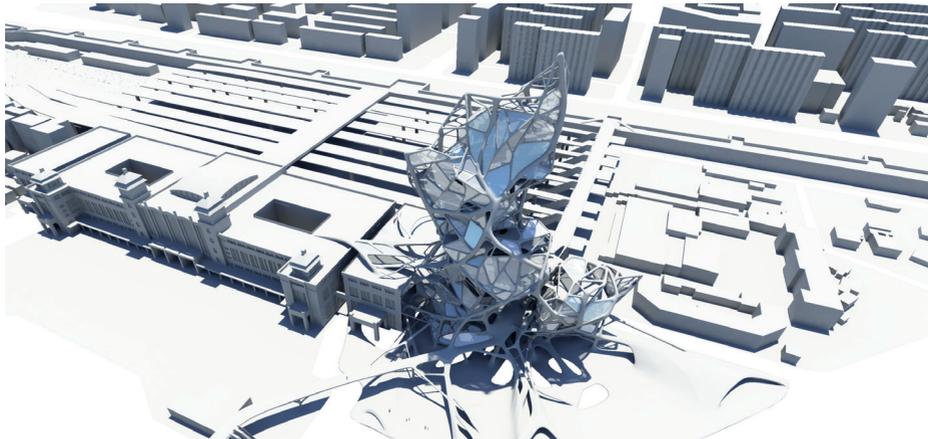
Dr.-Ing. Henriette Bier (MSc 4)

## FORMATIONS / EMBODIMENTS

Hyperbody's graduation lab MSc 3/4 involves a research driven design approach, which primarily focuses on articulating the complex relationship between social, environmental, spatial, technological and user based information with physical matter. Focusing on the development of architectural scale urban inserts, the MSc 3 studio investigates the aforementioned information sets in an associative manner with the help of computational and analogue apparatus in order to understand context as a behavioural field.

The term apparatus itself, shall be investigated from a systems view point to derive notational procedures which, in-turn will give rise to creative mapping techniques and produce systemic measuring rule sets serving as algorithms within the computational domain. The urban context, via such an understanding of an apparatus will result in the generation of a behavioural logic akin to an information embedded genetic blue print of the site under consideration. This Blue print consisting both qualitative and quantitative data, will subsequently be analyzed and experimented

MSc 4 2010 design studio: Final design output, Railway station extension, China  
Tutor: Dr. Nimish Bioria, Dr. -Ing. Henriette Bier  
Student: Shi Yang



with for its potentiality to embody and generate spatial formations with the use of evolutionary computational tools and techniques. Issues concerning material logics, environmental performance and structural optimization will serve as integral fitness goals for experimenting with such evolutionary computational methods. The relation between such potential genesis of form and its continual performance in time via auto-regulation of its spatial make-up shall thus become a critical area of investigation in the MSc 3 studio. The term "Formation" shall thus be understood as a self-organizing systemic population of spatial, structural, program and user based agents in time, which result in the generation of an emergent architectural condition.

A specific site within The Netherlands shall be chosen for the 2011 graduation studio within which the students shall conduct an in-depth analysis of intrinsic as well as extrinsic parameters. These will range from social interaction patterns, contemporary behavioural trends, demographic data, biorhythms, occupancy status and cultural inclinations to environmental parameters like wind, light, sound and water conditions etc.

The MSc 3 studio shall thus via a variety of exploratory strategies and research experiments pave the way for graduation projects in the MSc4 phase. To summarize, the Formations studio thus creates a solid foundation in computational design, engineering and above all paves a critical thinking process not only necessary for pursuing the MSc4 graduation design project at Hyperbody but also to become a design professional in the contemporary information driven era.

MSc 4 deals, therefore, with the selection of a specific 'formation' from MSC 3 and its implementation into architecture. This process requires in addition to bottom-up approaches (explored extensively in MSc 3) top-down methodologies for the specific implementation of 'formations' into 'architectural embodiments'. Bottom-up and top-down methodologies will be discussed in the MSC 3/4 studio with respect to their deterministic and non-deterministic, as well as procedural and object-oriented intrinsic nature and their impact on design. In this context, bottom-up methodologies refer to process-oriented approaches such as simulations employing swarm behaviors (Virtools) and particle spring systems (Processing) implying deterministic use of environmental, functional, and structural data for architectural design, while top-down methodologies refer to non-deterministic choices regarding use of formal language, for instance, that are object-oriented and imply a positioning and framing of the architectural work within the contemporary architectural discourse.

# TS3 HYPERBODY MSC 3/4

Technical Studies 3

Code AR3Aue22

Course Title Technical Studies 3: advanced computational methods

Credit points 6

Coordinator Ir. Jelle Feringa

Tutors Ir. Jelle Feringa

The Technical Studies 3 (MSc3) course introduces students to advanced design and manufacturing methodologies. It does so in the form of a series of workshops, lectures, seminars and excursions that initiate students to advanced concepts such as CNC manufacturing, simulation based design methodologies, evolutionary computing and architectural geometry. Students are introduced to contemporary architectural design challenges; the unfolding of geometry, how simulation analyses can be incorporated in design processes, the coupled problem of manufacturing and geometry. Therefore the workshops confront students to problems of contemporary architectural theory in the most hands-on, practical manner. The material taught in the Studies is crucial to the development of the Design Studio Projects.

MSc3 2009 design studio InfoMatters: Laser cutting and assembly process driven part prototype, Delft station  
Tutor: Dr. Nimish Biloria, ir. Marco Verde Eng, MArch.  
Student: Agata Kycia, Krzysztof Gornicki



## L&M3

Literature & Media 3

Code AR3Aue21

Course Title literature and media

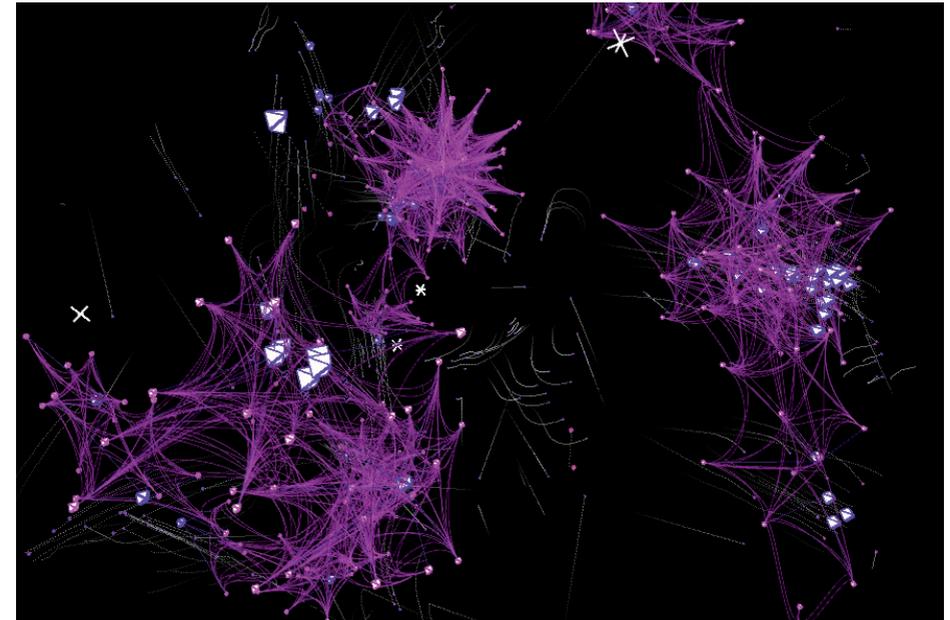
Credit points 3

Coordinator Dr. MarkDavid Hosale

Tutors Dr. MarkDavid Hosale

Drawing from specialized topics that lay at the inter-section between architecture and media art, this course is designed as an inquiry into the field of digital media, as it relates to the development of non-standard and virtual architecture. The final projects will be in the form of a dynamic, real-time interactive work that is a result of an in-depth study of a specialized topic as it is related to the course discourse. During the coming semester this course will focus on the development of adaptive systems as a means for the development of interactive installations and virtual environments. Adaptive systems describe a family of research topics that lie in the intersection between art /design and science. Emphasis of the research is not limited to techniques, but should be connected to the impact of these concepts on culture, art, architecture, and the speciation of new ideas.

SWARM INTELLIGENCE: Media Studies II MSc3 2010  
Tutor: Dr. MarkDavid Hosale  
Students: Bao An Nguyen Phuoc & Arie Willem De Jongh



## R&D3

### Research & Design 3

Code AR3Aue13

Course Title Research & Design Methods

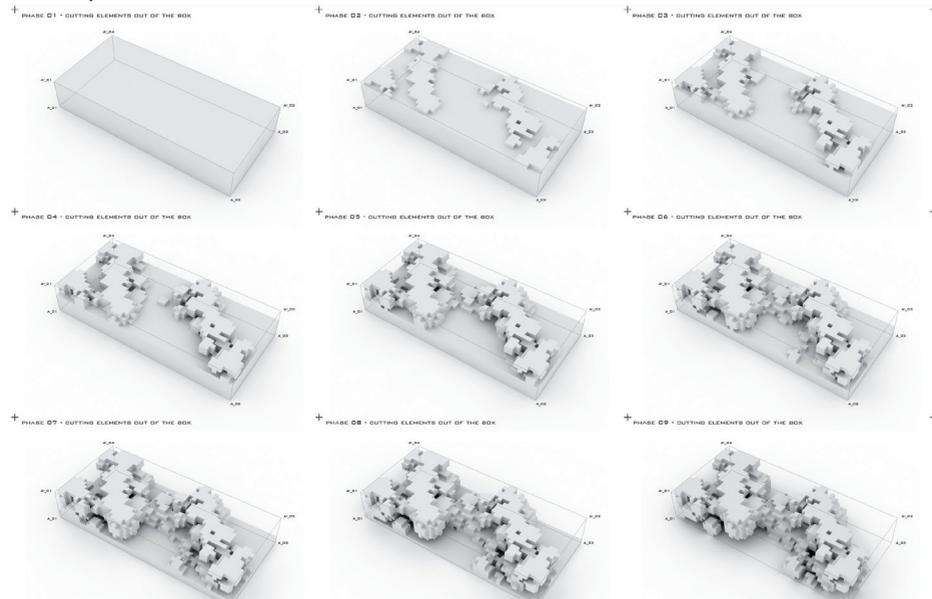
Credit points 3

Coordinator Dr. Ir. J. C. (Hans) Hubers

Tutors Dr. Ir. J. C. (Hans) Hubers

The goal of the Research & Design Method module is to learn scientific research and design methods. A method is a process, and a good way to learn a process is by doing it, while being corrected by a tutor. The result should be a scientific conference paper with two parts. Part 1 is about the state-of-the-art in the research field the students choose in groups. Part 2 shows the way the students applied the research in their design studio in MSc3. Students can choose subjects that fit in the goals of Hyperbody: non-standard and / or interactive architecture. We are at a design driven technical university and so especially design aspects of non-standard and interactive design should be studied, how design and technology are interlaced and interwoven in a complex whole of complementary argumentations. The content of the research is found by searching answers to research questions that the students have to formulate.

MSc 4 2010 design studio: Computationally driven form finding iterations, Warsaw Cultural Center, Poland  
Tutor: Dr. Nimish Biloria, Dr. -Ing. Henriette Bier  
Student: Krzysztof Gorniki



## ENROLMENT

(SOURCE: TU DELFT WEBSITE)

You can enrol as a student at a university as long as you meet certain admission requirements. However, specific admission requirements apply to the Bachelor's and Master's degree programmes:

Admission requirements for Bachelor's degree programme

Admission requirements for Master's degree programmes

In addition to the full-time Bachelor's and Master's degree programmes you can also enrol as:

student for a second degree programme  
external student  
minor student (guest student)

## STUDIELINK

First of all you need to register with Studielink, which helps you to organize your enrolment easily, clearly and quickly. But even after registering with Studielink this still does not mean you are enrolled at TU Delft.

You are officially enrolled once your payment form for the payment of the tuition fee has been processed, and not before. See Conditions and Liability of the TU Delft. The payment forms are dispatched by mail from (mid)June onwards, make sure your contact details are correct. Once your enrolment process has been

completed TU Delft will send you a Notice of Enrolment and you are now enrolled.

## NUMERUS CLAUSUS

As from September 2011, the TU Delft limits the number of First-year students enrolling in its Bachelor's programmes in Architecture, Industrial Design Engineering and Aerospace Engineering, in other words the TU Delft introduces a numerus clausus. Before 15 May 2011, you will need to register with the CBAP. Visit the website for more information.

## FINAL DEADLINE

In order to prevent problems with completion of your enrolment, we strongly request you to carry out the enrolment and to make the required payments before 1 August, with 30 September as the final deadline. This will enable you to make use of the educational facilities and to study without worries throughout the academic year. Retroactive enrolment is not permitted by law.

It is possible to enroll in a degree programme at TU Delft during an academic year that is already underway. Enrolment is possible from the first month (or later if wished) in which the enrolment process has been completed in full.

To learn more about admission please consult the Student Charter or contact the Central Student Administration.

# LIVING IN THE NETHERLANDS

(SOURCE: TU DELFT WEBSITE)

## THE NETHERLANDS AND DELFT

The Netherlands, a member of the European Union, is a very small country – just 200 kilometres east to west and 300 kilometres north to south. Much of the country is below sea level; it borders on the North Sea in the northwest, Belgium in the south and Germany in the east. The western region of the country is particularly densely populated. This is where the major cities are located, namely Amsterdam, Den Haag (the Hague) Rotterdam and Utrecht. The capital of the Netherlands is Amsterdam, with the Hague as the seat of the government. The country's maritime climate is mild. The temperature varies between five and fifteen degrees Centigrade in the spring and autumn, and between fifteen and thirty degrees during the summer. Rare icy conditions in the winter are the sign for thousands to take their skates on to the country's many lakes, rivers and canals.

You cannot do without a bicycle! If you don't want to spend much money, you

can get a fairly good second-hand two-wheeler. The national language is Dutch. Most adults in the Netherlands also speak English and understand German. The Netherlands is a country with many different minority groups and cultures; here you will meet people from the Antilles, Suriname, Turkey and Morocco, not to mention many Chinese.

The Netherlands is a constitutional monarchy, with the 'Minister President' or Prime Minister at the head of the government. The official head of state, Queen Beatrix, does not take a direct role in government. Members of the Dutch parliament are directly elected by the people. The country is centrally situated in Europe between Germany and Belgium, and close to France, Luxembourg and Great Britain. Most destinations are within reach by car or by train, and you can also travel inexpensively to farther places (e.g. London) by plane.

## DELFT

Delft is sometimes called de Prinsenstad, or the Princes' City. Prince William of Orange, an ancestor of the Dutch royal family, once held court here. Delft's rich past is still very much in evidence. The canals, the City Hall, the old market squares, the churches and cloisters, sixteenth and seventeenth century houses with typical Dutch gables - Delft is steeped in history.

Tradition-ally, members of the royal family are buried in the medieval church by the market place, which is ironically called the 'New Church', despite being several hundred years old. In the 'Old Church' is buried one of the city's famous sons: the painter Johannes Vermeer, born in Delft in 1632.

But Delft is also a modern city. Besides the University of Technology, many renowned technology-based companies have chosen Delft as their base. The many students living here make Delft a lively and vital city. For students and visitors it is an easy place to get to know and get around. There is good public transport, but most people ride bicycles to get to campus or to go out in the evenings to one of the lively pubs. For cultural outings, Amsterdam, Rotterdam and The Hague provide excellent museums, theatre, ballet and concerts.

## HOUSING AND SOCIAL LIFE

For non-EU/EFTA students housing is guaranteed upon scheduled arrival see further under FAQ). It is not difficult to find accommodation in Delft. There are many 'student houses' in which you have your own bedroom, but the other rooms (lounge, bathroom, kitchen, etc.) are shared. With some luck, you might

even come to live in a historic old canal house. Often, students living in the student houses share the cooking, have their meals together and undertake many social activities together.

Student societies (similar to American 'fraternities' or 'sororities') are numerous in Delft, some of them with long established traditions. It is well worth becoming a member, since much of student social life takes place within these societies. Some of them offer good meals for a special student price.

## INTERNATIONAL STUDENT ORGANIZATIONS

DISS (Delft International Students Society) is a student body aiming to stimulate contact between Dutch students and their overseas counterparts. They organize activities like workshops, debates, cultural and sporting events and, of course, parties. There are regular weekly meetings. AEGEE (Association des Etats Généraux des Etudiants de l'Europe). This European association aims to help its members get to know other students and cultures within Europe. The Delft branch takes part in various European projects, and also organizes many activities at local level, e.g. lectures, outings and parties. There is a weekly get-together in a café Luniz at the Delft shopping district De Nieuwe Veste.

# CONTACT

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