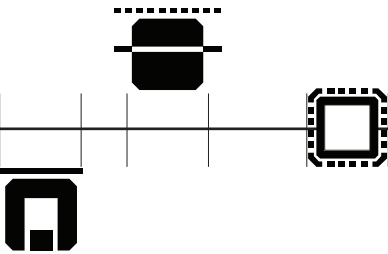


NAVIGATOR

GSAPP FALL 2016

CORE I

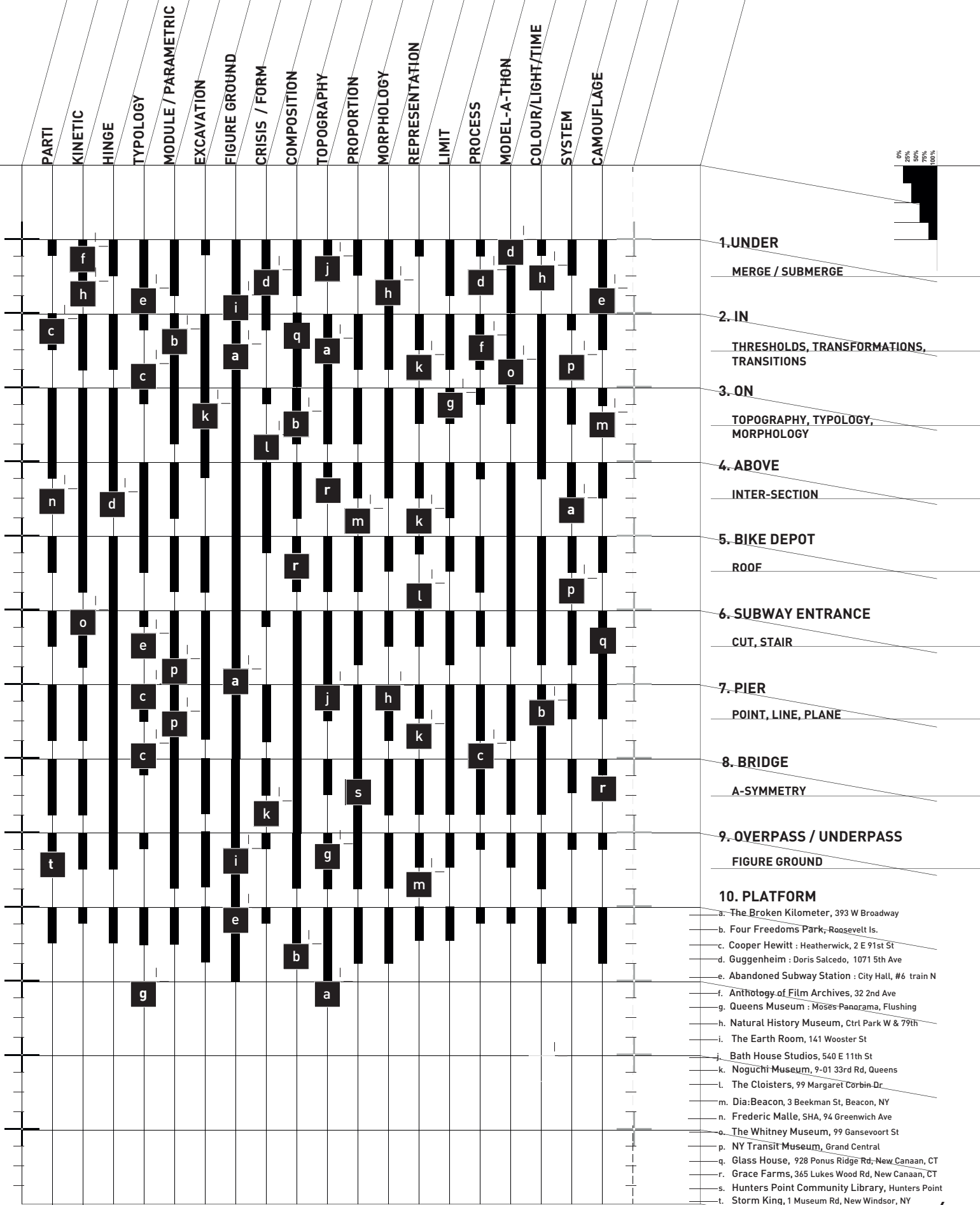


CORE I STUDIO
LAYOUT>

5

STUDIO DECLARATIONS

1. We will work intensely and collaboratively.
2. Ideas must be valued and clearly represented.
3. High energy, open-mindedness and engagement with the wider world are prerequisites.
4. Constructive criticism and bold design responses constitute our communication.
5. Our creative palette includes the interconnection of complexity and simplicity, light and shadow, form and space, materiality and structure.



1. UNDER

- 1.1 MOUSE / LANGUAGE
- 1.2 BUOYANCY / FLUID DYNAMICS RESEARCH
- 1.3 NAUTICAL / AERONAUTICAL ENGINEERS
- 1.4 RADIAN VOLUME

2. ABOVE

- 2.1 INTER-SECTION
- 2.2 CORNER ANALYSIS / THINSE
- 2.3 TRANSFORMATION
- 2.4 FINAL REVIEW

3. UP CLOSE AT A DISTANCE : LAURA KURGAN

4. MODEL - A - THON : MARK MORRIS

- 4.1 SCALELUDITY
- 4.2 CASTING AND PIMMATURES
- 4.3 CASTING AND PIMMATURES
- 4.4 ROBOTICS
- 4.5 PRODUCTION MATERIALS
- 4.6 GENERATIVE FABRICATION

5. IN

- 5.1 THRESHOLDS, TRANSFORMATIONS, TRANSITIONS
- 5.2 MTA - TRANSPORTATION
- 5.3 GRIDS, CITY PLANNING
- 5.4 ANALOGY / POINT / PROTO ELEMENT
- 5.5 FLOW

6. COLOUR / LIGHT / TIME : HERVÉ DESCOTTES

- 6.1 COLOUR
- 6.2 LIGHT
- 6.3 TIME

7. ON

- 7.1 PIER
- 7.2 EDGE
- 7.3 LIMITS

8. UNORTHODOXITY : MISHA KAHN

- 8.1 MATERIALS AND PROCESS

9. HOW TO MAKE A BOOK : JESSE SEGERS

- 9.1 PORTFOLIO WORKSHOP

1. KINETIC WEEK TWO

2. HINGE WEEK THREE ALFIE KOETTER

3. PARTI WEEK FOUR ERICA GOETZ

4. FIGURE GROUND WEEK FIVE ADAM FRAMPTON

5. MODULE WEEK SIX TEI CARPENTER

6. PROPORTION WEEK SEVEN JOSH UHL

7. TYPOLOGY WEEK TEN CARRIE NORMAN

8. COMPOSITION WEEK TEN WILLIAM ARBIZU

9. PARAMETRICISM WEEK TWELVE GSAPP ALUMNI 1

10. TOPOGRAPHY WEEK TWELVE GSAPP ALUMNI 2

11. MORPHOLOGY WEEK THIRTEEN GSAPP ALUMNI 3

12. REPRESENTATION WEEK THIRTEEN GSAPP ALUMNI 4



11. SEP

UNDER FILM SERIES

DUALITY
DREAM / REALITY
SCALE
DISTORTION
PERCEPTION

THE GOLEM
THE CABINET OF DR. CALIGARI
UN CHIEN ANDALOU
8 1/2
BARBARELLA

PAUL WEGENER
ROBERT WEINE
LUIS BUNEL
FEDERICO FELLINI
ROGER VADIM

1920 GERMANY
1920 FRANCE
1929 FRANCE
1963 ITALY
1968 FRANCE/ITALY

25. SEP

ABOVE

SUBWAY
UNDER / IN

THE NAKED CITY
BLADERUNNER
KONTROLL

JULES DASSIN
RIDLEY SCOTT
ANTAL NIMRÖD

1948 USA
1982 USA
2003 HUNGARY

24. SEP

CORE I ON TOUR

EXCURSION TO UPSTATE NEW YORK

COMPOSITION
ICONS
DOCUMENTATION
GRAPHICS
DESIGN
SPEED AND TIME

RASHOMON
CONTEMPT
THE SHINING
KOOLHAAS HOUSELIFE

AKIRA KUROSAWA
JEAN-LUC GODARD
STANLEY KUBRICK
ILA BÉKA / LOUISE LEMOINE

1950 JAPAN
1963 FRANCE
1980 USA
2008 ITALY

28. SEP

MODEL - A - THON

MODEL SYMPOSIUM + COLLOQUIUM

▶ MARK MORRIS + HILARY SAMPLE + CHRISTOPH a KUMPUSCH + WES ROZEN
JENNIFER OLSHIN + JOSH JORDAN + KATHY BATTISTA + Yael EREL

10. OCT

COLOR / LIGHT / TIME

▶ HERVE DESCOTTES

16. OCT

IN

CINEMATOGRAPHY
SCALE
MEASURE OF TIME
LIGHT
SUSPENSE

METROPOLIS
THE THIRD MAN
REAR WINDOW
2001 A SPACE ODYSSEY
THEY SHOOT HORSES, DON'T THEY
CHUNGKING EXPRESS

FRITZ LANG
CAROL REED
ALFRED HITCHCOCK
STANLEY KUBRICK
SYDNEY POLLOCK
KAR WAI WONG

1927 GERMANY
1949 USA
1954 USA
1968 USA
1969 USA
1994 HONG KONG

28. OCT

UNORTHODOX MATERIALS

▶ MISHA KAHN

13. NOV

ON

CINEMATOGRAPHY
CAMERA ANGLES
LONG LENS AND ZOOM
ICONS
CRISIS
REPETITION
PERCEPTION
TIME AND SCALE
SET DESIGN

TOKYO STORY
HIGH AND LOW
BLOW-UP
MODERN TIMES
THREE DAYS OF THE CONDOR
POWERS OF 10
THE PRUITT-IGOE MYTH

YASUJIRÔ OZU
AKIRA KUROSAWA
MICHEALANGELO ANTONIONI
CHARLIE CHAPLIN
SIDNEY POLLOCK
CHARLES AND RAY EAMES
CHAD FRIEDRICH

1953 JAPAN
1963 JAPAN
1966 ITALY
1936 USA
1975 USA
1977 USA
2011 USA

14. NOV

HOW TO MAKE A BOOK

▶ JESSE SEGERS

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<http://archinect.com/news/article/131099299/floating-city-project-advances-to-phase-ii>

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<http://www.theplan.it/eng/magazine>

The Plan 074, no. 05, 2014. (Stefan Behnisch, Busarchitektur, Zaha Hadid Architects, Atelier Hitoshi Abe, Crab Studio, Estudio Carme Pinos, No.Mad Arquitectos, Eduardo Arroyo...)

The Plan 058, no. 05, 2012. (Beniamino Servino, Morphosis Thom Mayne, Herzog & De Meuron, Bernard Tschumi Architects, Vir.Mueller Architects, Architectenbureau Koen Van Velsen,...)

DETAIL

Zimmermann, Astrid, ed. Constructing Landscape. Detail, 2011

Schittich, Christian, ed. Structure. Detail, 2015.



A The Plan 058, 2012

MODEL MAKING FACT SHEET

MODEL TECHNIQUES

> Wire / Metal rods / Metal sheets

SOLDERING

<http://www.instructables.com/id/How-to-solder-the-secrets-of-good-soldering/>
Copper solders the easiest, however steel wire, silver, gold, brass and aluminum (though aluminum may need a special type of solder).

References:

Gregor Holzinger <http://www.donebymaking.net/>
Lee Bul, Mon grand récit: Weep into stones, 2005
Lee Bul, Drifting Ashen Flake Opaque, 2008

TENSEGRITY

The word 'tensegrity' was invented by Buckminster Fuller to describe how the balance of tension and compression could be used to create a stable structure (in other words, a structure with integrity).

References:

Kenneth Snelson, X-Piece
Kenneth Snelson, The Needle Tower
Johannes Zabel under Moholy-Nagy at the Bauhaus, "a study in balance," 1923
Robert le Ricolai, Automorphic Compression Member & Automorphic Tube Model
Robert le Ricolai, Double Parabolic Trihex Bridge for the Skyrail
Robert le Ricolai, Aleph Bridge
Karlis Johansons, spatial construction, 1920
Nasa Landing Vehicle
Buckminster Fuller, Tensegrity Sphere

GLASS BLOWING

<http://www.brooklynnglass.com/products>
<https://www.urbanglass.org/classes>

References:

El Ultimo Grito, Imaginary Architectures
Dale Chihuly, Mille Fiori, 2008

FOAM

Great for massing study models and quick experiments. Also useful to make blue (or purple) foam molds for rockite or other pours. Make sure to use foam glue that will not erode the foam (although this may be desired!). It is easiest to cut foam with a foam cutter, but it is possible to use an exacto.

<https://www.youtube.com/watch?v=fi3CAtpvJJs>

ACETONE

Use this substance for image transfers onto a surface. It can also be used to "erode" foam models (a helpful tool in this case could be a syringe or device to control injection).

IMAGE TRANSFER

www.youtube.com/watch?v=-qBaSd0pN8Y

3D PRINTING

PLEASE SEE GSAPPS OUTPUT SHOP TUTORIALS

MILLING

PLEASE SEE GSAPPS FABRICATION SHOP TUTORIALS

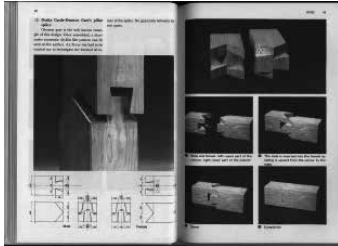
<https://www.arch.columbia.edu/research/labs/4-fabrication-lab> REQUIRED TRAINING

WOOD

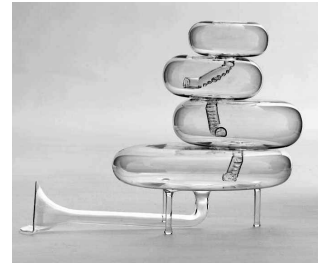
Joint Taxonomy: There is no limit how two or more pieces of wood come together. Put an Idea behind this tectonic connection, conceptual and/or performance based.

References:

Marc Fornes / Theverymany, Echinoids 01
Doug and Mike Starn, Big Bambú
Raimund Abraham, Church on the Berlin Wall model
Peter Eisenman, City of Culture model



A Torashichi Sumiyoshi, Gengo Matsui, Wood Joints In Classical Japanese Architecture, 1991



B El Ultimo Grito, Imaginary Architectures, House,

MATERIAL TECHNIQUES

> SPACKLE

Spackle can give you interesting texture when mixed with pigment and smeared like stucco onto a contour model. It can also be sanded after drying to achieve a more even, smooth texture.

RESIN

This material can be tricky to work with and is toxic, so make sure to pour in a vented space (not studio). It can be colored or left clear. You can also cast other materials into it with experimentation. Molds can be made out of plastic or silicone. This material can be beautifully lit once made because of its transparent quality.

casting tips

<http://joemreform.com/casting-resin/>

References:

Kevin Beasley, Strange Fruit @ The Guggenheim Museum

materials : Nike Air Jordan 1 shoes, resin, polyurethane foam, tube socks, shoelaces, rope, speakers, hypercardioid and contact microphones, amplifiers, patch cables, and effects processors

OMA, Paris Les Halles Model, 2003

Silicone Mold Making for Resin Casting

<https://www.youtube.com/watch?v=9ukHq7oQock>

WAX/ SOAP

These two materials are also translucent, but not as transparent as resin can be; they appear more cloudy, but also can capture and emit light. You can use a variety of materials to create a mold including: plaster, silicone are best, but almost anything that doesn't melt can be used as a mold. Soap or wax can also be poured into the base of a model to represent water.

PLASTIC

Vacuum Mold

You can use various mold types for vacuum forming plastic including: foam, milled wood, cardboard, chipboard, etc. Be conscious of webbing that may occur depending upon tolerances and mold construction.

<https://www.youtube.com/watch?v=eUB58z8apTE>

<http://isites.harvard.edu/fs/docs/icb.topic907894.files/FormechVacuumGuide.pdf>

Pigmented Plastic / Plastic Sheets

References:

Pawet Althamer, Judith, 2011

materials: Pigmented plastic, plaster, paint, and steel armature with wheels

Lebbeus Woods, Nine Reconstructed Boxes, 1999

PVC Foam Sheets

WELDING

Sheet Metal

www.youtube.com/watch?v=Bk-deP30A-k

<http://www.mig-welding.co.uk/thin-metal.htm>

Tubes / Pipes

tools: blow torch, welding

CASTING

Rockite

The best mold material for pouring rockite is blue foam, but acrylic, foam core, wood and chipboard can also work depending upon the desired finish. An acrylic mold achieves a more "shiny" finish on the rockite. Mold release helps to more easily remove the cast shape.

Plaster

In order to pour plaster, you can use acrylic, foam or foam core, depending upon desired effect /texture.

*To minimize air bubbles, you may softly tap the mold in the beginning as it is drying.

Metal

<https://www.youtube.com/watch?v=IYZ0Tt9zTv0>

Suprastudio, Animated Casting, Robotic Technology

http://www.aud.ucla.edu/programs/m_arch_ii_degree_1/studios/2014_2015/lyn-n/?p=1212

MATERIAL TECHNIQUES

> CHIPBOARD / CARDBOARD

This brown pressed paper makes a great material for contour models as well as general massing of shapes and structures, thereby making it a staple for most models. It comes in multiple thicknesses and depending upon the manufacturer can be a warm gray to cardboard brown in color.

References:

Lebbeus Woods, Stars House

BRISTOL BOARD

Another type of pressed paper board, but this time its white as snow.

LIGHT

References:

James Turrell, Sky Space

Dan Flavin

Spencer Finch

Ivan Navarro, Homeless Lamp, the Juice Sucker, 2004–05

ACRYLIC

This material is easiest to laser cut, but can also be cut by hand using an acrylic cutter (available at Janoffs). It is easiest to assemble using acrylic glue, but also consider designing joints that eliminate the need for glue.

If laser cut, etching can be very effective to create depth within a model.

References:

Sou Fujimoto, Art Sketch, Architecture as Forest exhibit

Sou Fujimoto, Primitive Future House, 2001

Sou Fujimoto, Bus Stop model

OMA, Proposed addition to Whitney Museum in NY

Tom Leader Studio, Temporal Map of Rome, 15 acrylic layers, 1999

no materials are off limits.....

EXPERIMENT !!!!

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Zugmann, Gerald. Blue Universe: Modelle Zu Bildern Machen; Architectural Projects by Coop Himmelb(l)au. MAK Center for Art and Architecture, L.A., 10. Mai 2002. Ostfildern-Ruit: Hatje Cantz, 2002.

SUPPLIES

- > **Utrecht : 21 E 13th St**
general art supply, canvas, plaster, paper, paint, brushes
- Janoff's : 2870 Broadway**
white board, paint, metal, piano wire, wood, foam core, cutting supplies
- Compleat Sculptor : 90 Vandam St**
plaster, resin, blackener, metal, rockite, blue foam, casting information, wax, clay
- Canal Plastics : 345 Canal St**
acrylic sheets , tubes, cubes, mylar, mirrored paper
- Canal Rubber : 329 Canal St**
rubber textures
- Metalliferous : 34 West 46th Street, 3rd Floor**
soldering / metal supplies
- The Home Depot : 40 W 23rd St**
tools, screws, nuts, bolts, lumber, rope, paint, screen
- Space Surplus Metals: 325 Church St**
Aluminum, Brass, Copper & Steel
- McMaster-Carr Supply Company : 473 Ridge Rd**
- T&T Plastic Land : 315 Church Street**
- AJO Ace Home & Lumber Depot : 610 Columbus Ave**
lumber
- Metropolitan Lumber Midtown : 617 11th Avenue**
tools, materials, open 7 days, delivery avail.
- Prince Lumber Co. : 404 West 15th Street**
- Industrial Plastics : West Orange, NJ**
- Pearl River Mart : 477 Broadway**
fabric, paper, boxes, random other materials...
- University Hardwares : 2905 Broadway**
rockite, paint, screws, nuts, bolts, tools, rope
- LASER CUTTING:**
 - Fabberz : 580 8th Avenue, 21R**
laser cutting, materials available in shop
- XEROGRAPHICS:**
 - Village Copier : 1181 Amsterdam Ave**
quick turn around printing, simple binding options
 - Columbia Copy Center : 2792 Broadway**

MAKER BOX

- > The GSAPP modelLAB is conceived as a platform to explore and advance the role of physical models, prototypes and environments at the university and beyond. Its aim is to question the role of architectural scale models in the design process and to consider their relevance in contemporary discourse, counteracting a design methodology focused predominantly on digital representation.

A BRIEF HISTORY

Before the 1990s, physical models were the most effective way to represent space in three dimensions. As the design process has been increasingly out-sourced to the computer, architects draw and model less in physical space. The paperless studios at Columbia University GSAPP in the mid-90s were a radical departure from preconceived notions of architectural production. Trends towards increasingly digital production necessitate a redefinition of the current relevance and role of physical models in architecture.

Physical models form a parallel history of architecture, undergoing a number of shifts and cycles. While the Renaissance is widely regarded for the innovation of techniques in drawing – famously the invention of perspective – it was the physical model that was the predominant mode of notation at the time. Filippo Brunelleschi won the commission to construct the dome of the Cathedral of Florence in 1418 by presenting a competition model. Subsequent models were built throughout all phases of design and construction, testing structural properties and accommodating opinions and changes made by other architects, noblemen, construction workers and laymen.

ARCHITECT AS MAKER

Mario Carpo describes this design process as autographic– the architect as an artisanal maker, directly involved in construction working together with the craftsmen until completion of the building. The architect is immediately forced to consider material, weight, scale, and relationships through a physical composition. Carpo positions this authorial approach in contrast to the 'allographic'- where the design process is broken down into a linear hierarchical process- the architect as a designer is removed from the building process, only creating drawings that will later be realized by somebody else. Based on Carpo's definitions, autographic design seems to privilege the physical model, while the allographic is closely related to the abstraction of a drawing. Models are autographic because they allow for easy collaboration between multiple authors, as well as direct modification through them. They present a flexible yet precise environment, creating a level of sensitivity and freedom that simultaneously provides almost instantaneous feedback; a loop. They are the most effective way to communicate space to laymen not trained in reading technical drawings. Drawings on the other hand are allographic in their quality of being abstract and technical– they are better suited for construction when the author is not present as precise measurements can be taken from them. They allow for intellectual and removed authorship- producing a notational bottleneck, because the amount of information in a drawing is limited to the two-dimensional plane.

Olafur Eliasson sees models as an integral part of the design process when he writes, "Models have become co-producers of reality", as they are not anymore simply "conceived as rationalized stations on the way to a perfect object.". Whereas Models used to be a stage on the way to reality, Eliasson articulates a shift where models evolve into other models, all as part of reality, rather than a precursor to it.

The process of building and the manifestation of that endeavor foster an iterative evolution of three dimensional spatial conceptions. It forces the author to photograph, document, zoom in or out, and make decisions with regards to the ground among other complex considerations. The process exists in parallel yet simultaneously surgically connected to drawing; a negotiation between mediums that collaborate and speak to each other creating both tectonic and highly imaginative worlds.

The GSAPP modelLAB explores exactly this fertile nexus- the intersections, overlaps and also differences between physical and digital modeling, examining the role of models in all aspects of the design and construction process. Concrete aims are to foster a culture of exploration in representational techniques through the development of an appreciation for exceptional models through awards and competitions, while creating discussions and intense workshops that improve the school's resources. Bridging the gap between digital and physical worlds, this forum does not intend to promote one without the other, but rather create a more critical dialogue between the two.

Architecture is a profession engaged in the creation of

the physical,
the prototype,
the model.

CORE I —
LOG BOOK

STRUCTURE

STRATEGY

OUTPUT

A. 3D-MODELS

COLLECTION >> EDIT

DIAGRAMS / PHOTOGRAPH

OVERALL / CONTEXTUAL / PHOTOGRAPHY

USEFUL / INFORMAL

RESEARCH -> COLLECTION/BUILD-UP -> EDITING

RE-PLUS IN

B. DETAIL

ZOOM - ZOOM - IN - MODELS

NEW DRAWINGS

PLAN / SECTION / AXONOMETRIC / X-RAY

CONSTRUCTION SHOTS -> PHOTOGRAPHY
DRAWINGS

C. BUILDING ANATOMY

N x 3D ZOOM - IN - MODELS

NEW DRAWINGS 2

DETAIL / ZOOM-IN / LANGUAGE / EXPLOSION

RESEARCH -> CAREFULLY RECONSTRUCTING SPECIFIC BUILDING INFORMATION

D. DIAGRAMS

SPECIFIC LENSES / FOCAL POINTS
SPECIES AND THEMATIC CLUSTERS
COMPARISON

TAILORED MEDIA

FILM / COLLAGE / PHOTOGRAPHY

E. WHOLE

OVERALL PROJECT INFORMATION

PICTOGRAMS

ICON

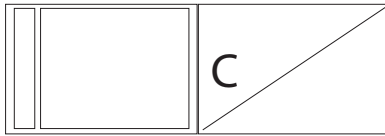
RESEARCH -> CAREFULLY RECONSTRUCTING OF GENERAL BUILDING INFORMATION
SITEPLAN / PLANS / SECTIONS / ELEVATIONS / PICTOGRAMS / ...

GROUNDWORK

INTRA PROJECT

VISION

COVER



INTRODUCTION

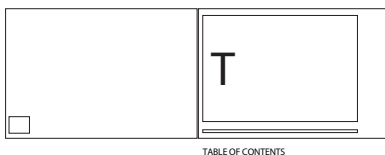
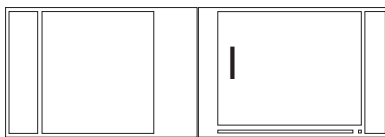


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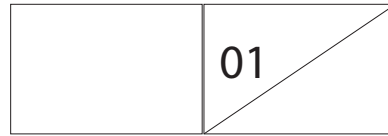
INTRODUCTION

INFO-GRAPHICS

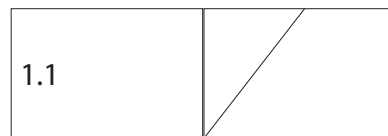
DIAGRAMS / RESEARCH / COLLAGE



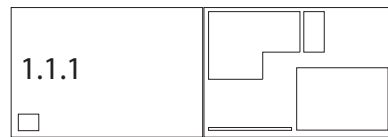
3D MODELS



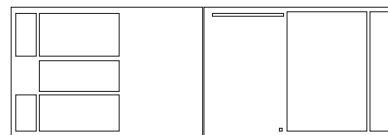
1 OF N - ZOOM SUB LENS



ETYMOLOGY + DEFINITION x N



SITE

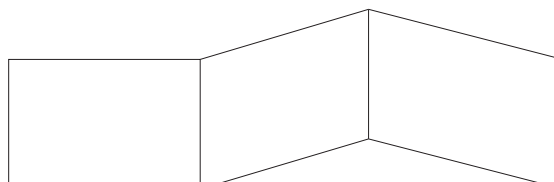


DRAWINGS

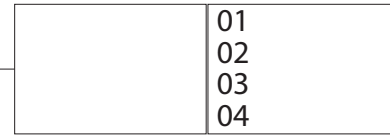
DIAGRAMS / PLANS / SECTIONS / AXONOMETRIC / XRAY



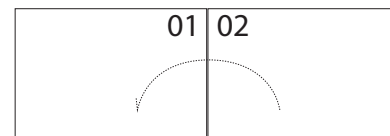
SEQUENCE



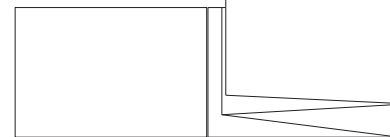
EXPANSION



REFLECTION



CONSTRUCTION



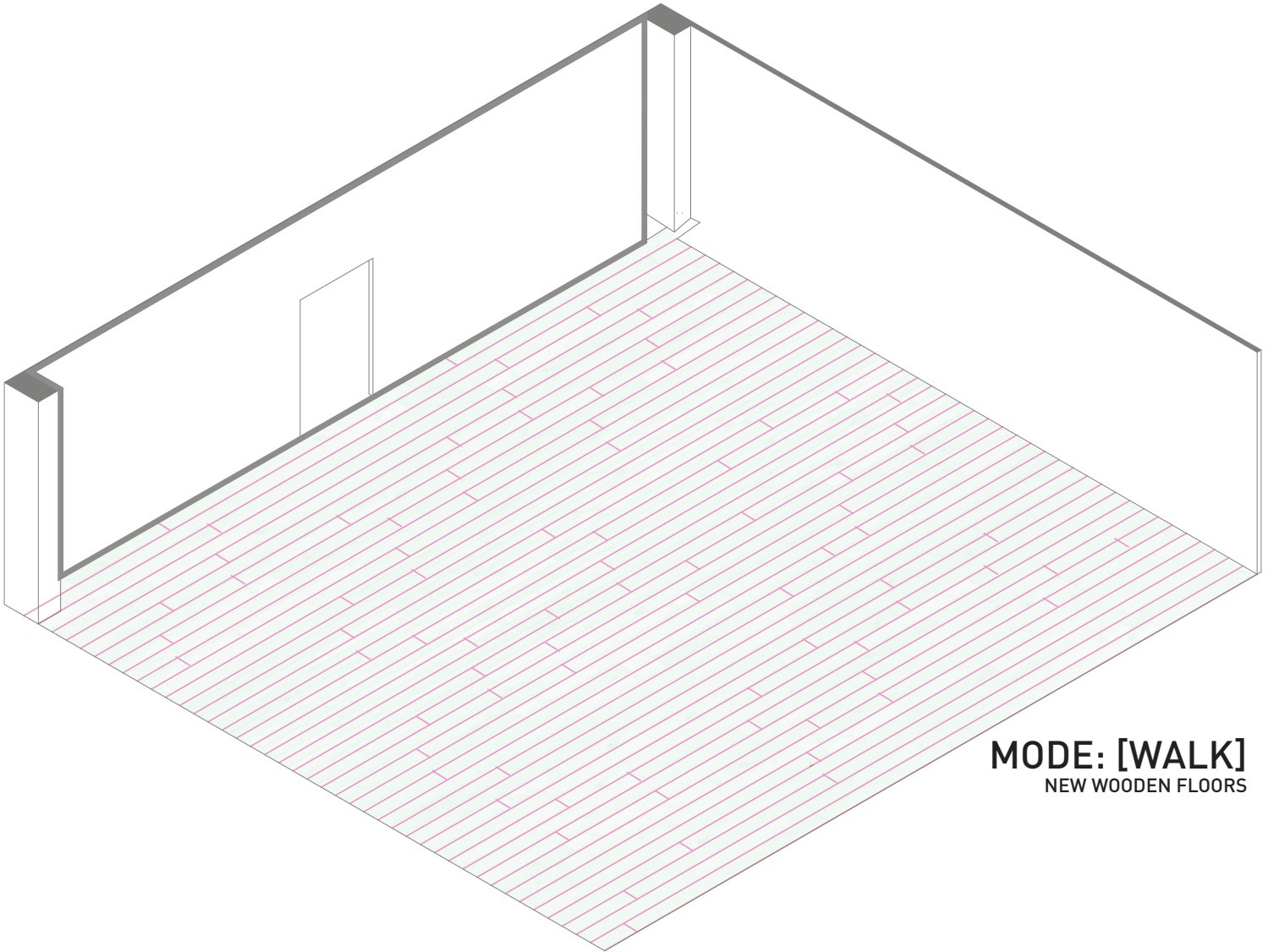
A

B

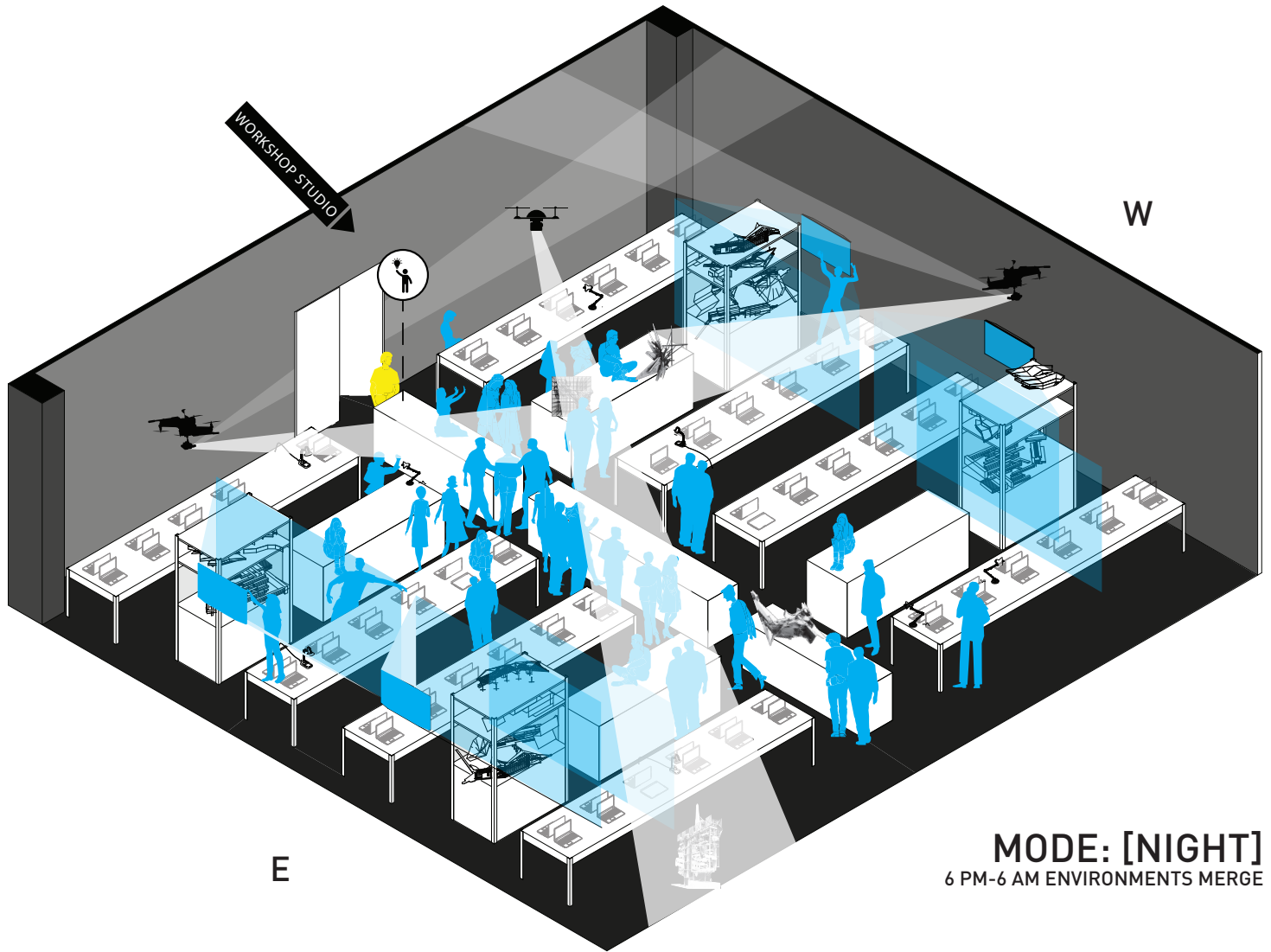
C

**ACTIVATED
STUDIO SPACE**

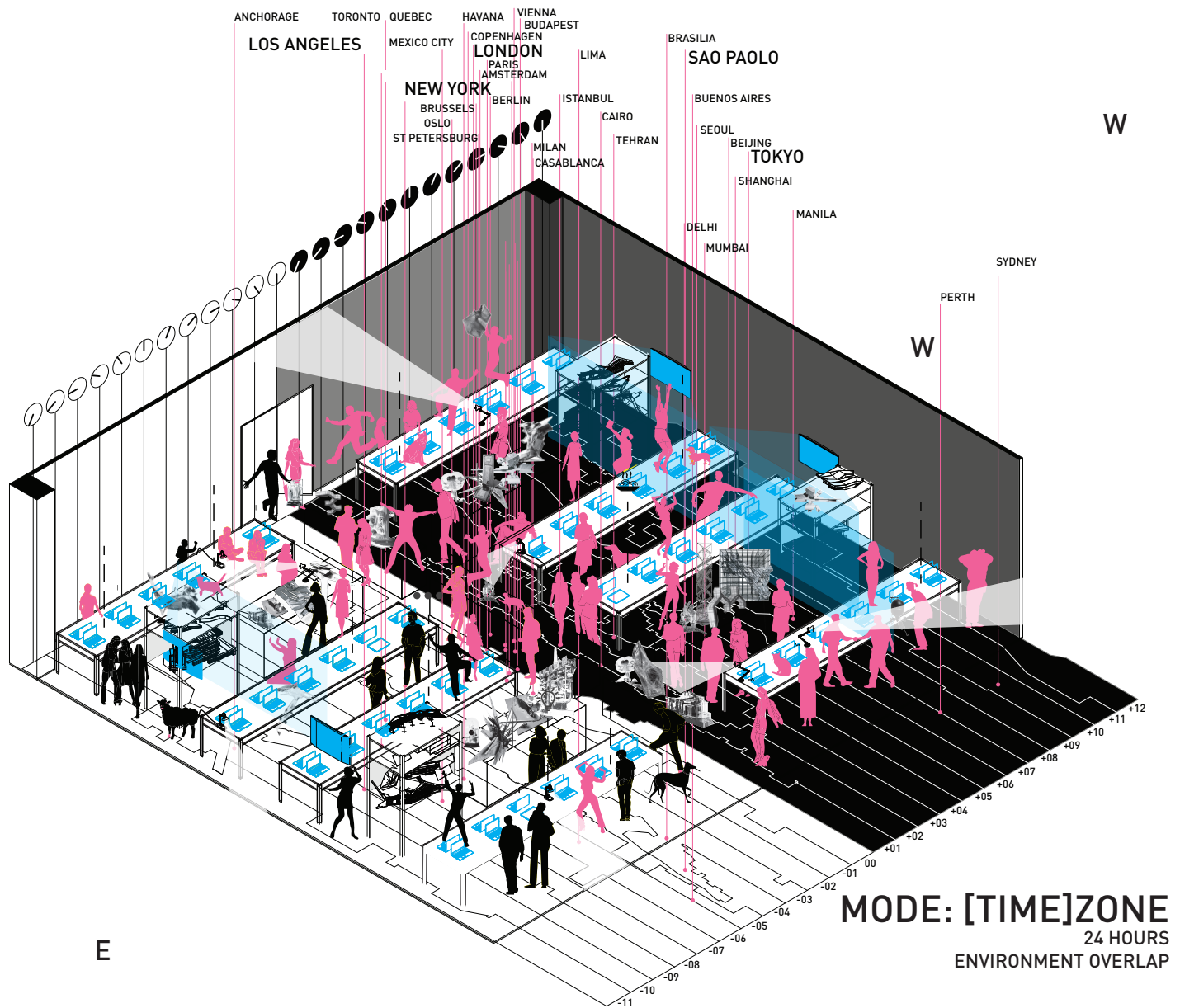
v

**MODE: [WALK]**
NEW WOODEN FLOORS





MODE: [NIGHT]
6 PM-6 AM ENVIRONMENTS MERGE



NAVIGATOR

GSAPP FALL 2016

CORE I



UNDER



EXTENDED READINGS

> Andres Jaque, *Cosmo*, PS1, 2015

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CONCEPTUAL

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- Archigram, *Walking City*
- Buckminster Fuller, *Dymaxion Car*
- Fischli and Weiss, Equilibres photo series, 1984-1987
- Fischli and Weiss, The Way Things Go
- Laszlo-Moholy Nagy, *Light Space Modulator*
- Dustin Yellin
- Edward Muybridge, photograph series of motion
- Étienne-Jules Marey, *Seagull*
- Frank and Lily Gilbreth, motion studies (part of Taylorist scientific management studies)
- Kevin Francis Gray, *Kids on a Tomb*
- Kisho Kurokawa, Helix City, 1961
- Kiyonori Kikutake, Marine City, 1959
- Lebbeus Woods, *Photon Kite*
- Liu Bolin, Camouflage
- Louis Kahn, *Point Counterpoint II*
- Oil platforms (AKA coast of Brazil where oil industry is booming)
- Robert Gober, *Untitled*, Wax, cloth, wood, leather and human hair 1991, @The Whitney Museum, Floor 5
- Robert Smithson, Floating Island, 1970
- Desiree Palmen, camouflage art, *old city suit / surveillance camera (jerusalem 2006)*
- Wes Andersen, *The Belafonte*
- The floating islands of Lake Titcaca, Bolivia, history of floating cities
- The Vernon Bain Correctional Center (NYC Prison Barge floating in the East River)



A Transmitter, Bjoern Schuelke, 2011

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>

BODY EXTENSION

> Coop Himmelblau, *The White Suit Project, The Cloud, Restless Sculpture*

Haus Rucker, *Yellow Heart / Oasis 7 / Flyhead*

Kazimir Malevich, *Dance of Forms*

Meejin Yoon, *Defensible Dress*, 2001

Oskar Schlemmer, *Triadic Ballet*

Walter Pichler, *Prototypes*, 1967

MODEL MAKING

KINETIC SCULPTURE

> Andrew Smith, *Kinetic Sculptures*

Bjoern Schuelke, *The Observer, Drone #7*

Chuck Hoberman, *Hypar*

Constant Nieuwenhuys, *Models for New Babylon*

Hugh Broughton, *The Halley VI Centre*

Karl Normanton and Ian Laurance, *Neon Cactus*

Philip Beesley, *Protocell Mesh, Hylozoic Ground*

SLO Architecture, *Harvest Dome 2.0*

Smout Allen, *Surface Tension*

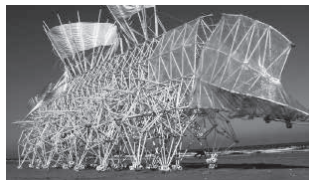
Tim Hawkinson, *Uberorgan*, 2000

Theo Jansen, *Strandbeest*

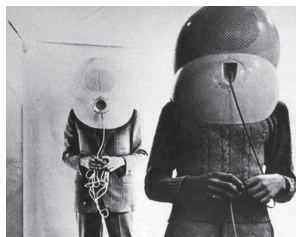
UNDER

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Core I Coordinator: Christoph a. Kumpusch

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> CARRIE NORMAN



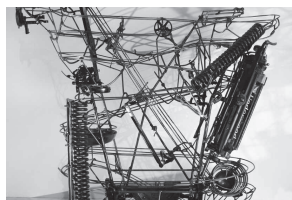
THEO JANSEN, *STRANDBEEST*



WALTER PICHLER, *PROTOTYPES*, 1967



KAZIMIR MALEVICH, *DANCE OF FORMS*



ANDREW SMITH



COOP HIMMELBLAU, *THE CLOUD*



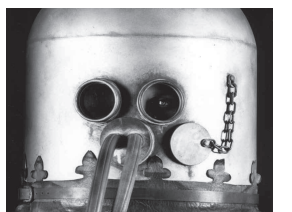
HAUS RUCKER, *FLYHEAD*



LASZLO-MOHOLY NAGY,
LIGHT SPACE MODULATOR



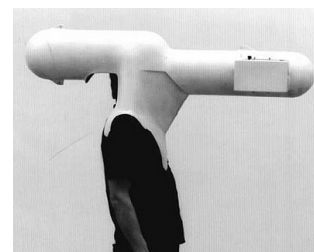
OSKAR SCHLEMMER, *TRIADIC BALLET*



KLINGERT DIVING MACHINE



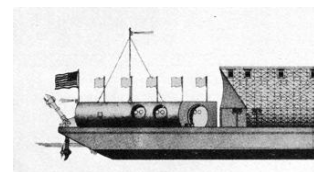
ÉTIENNE-JULES MAREY, *SEAGULL*



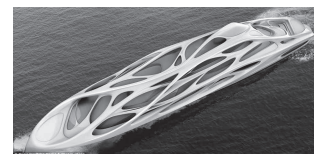
WALTER PICHLER, *PROTOTYPES*, 1967



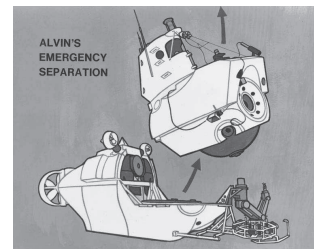
WES ANDERSON, *THE BELAFONTE*



LOUIS KAHN, *POINT COUNTERPOINT II*



ZAHA HADID, *UNIQUE CIRCLE YACHTS*



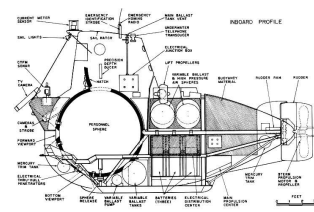
DSV ALVIN



PHILIP BEASLEY, *HYLOZOIC GROUND*



DESIREE PALMEN, *CAMOUFLAGE*



US NAVY, *SMALL SUBMERSIBLE*

FACT SHEET

BUOYANCY DETAILS

buoy

boy/

verb

1.

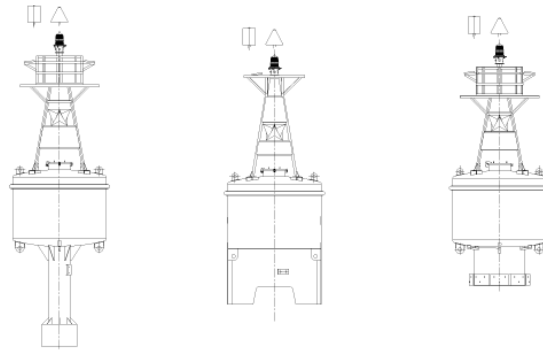
keep (someone or something) afloat.

"the creatures could swim, both buoyed up and cooled by the water"

noun

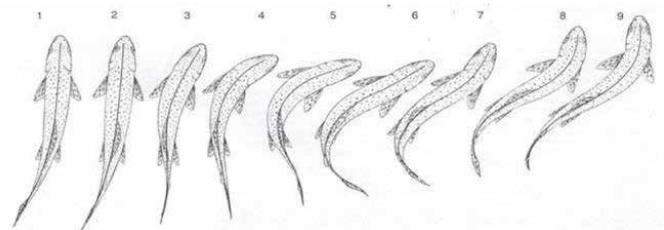
1.

an anchored float serving as a navigation mark, to show reefs or other hazards, or for mooring.



FISH LOCOMOTION

Vector forces exert on the plane, surface and volume of water by a motion which generates thrust, a force backwards in which propels the object forward. Fish swim by creating this force against its surrounding environment. Muscles, Tendons, Contraction and expansion allow for these propulsions;



thehelpfulteacher.blogspot.com

Body propulsion

Anguilliform locomotion

Sub-carangiform locomotion

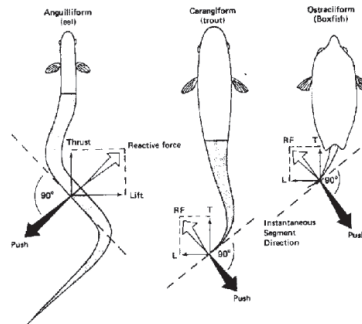
Carangiform locomotion

Thunniform locomotion

Ostraciiform locomotion

Dynamic lift

Oscillatory



<http://palaeos.com/>

LOCAL SUPPLIES

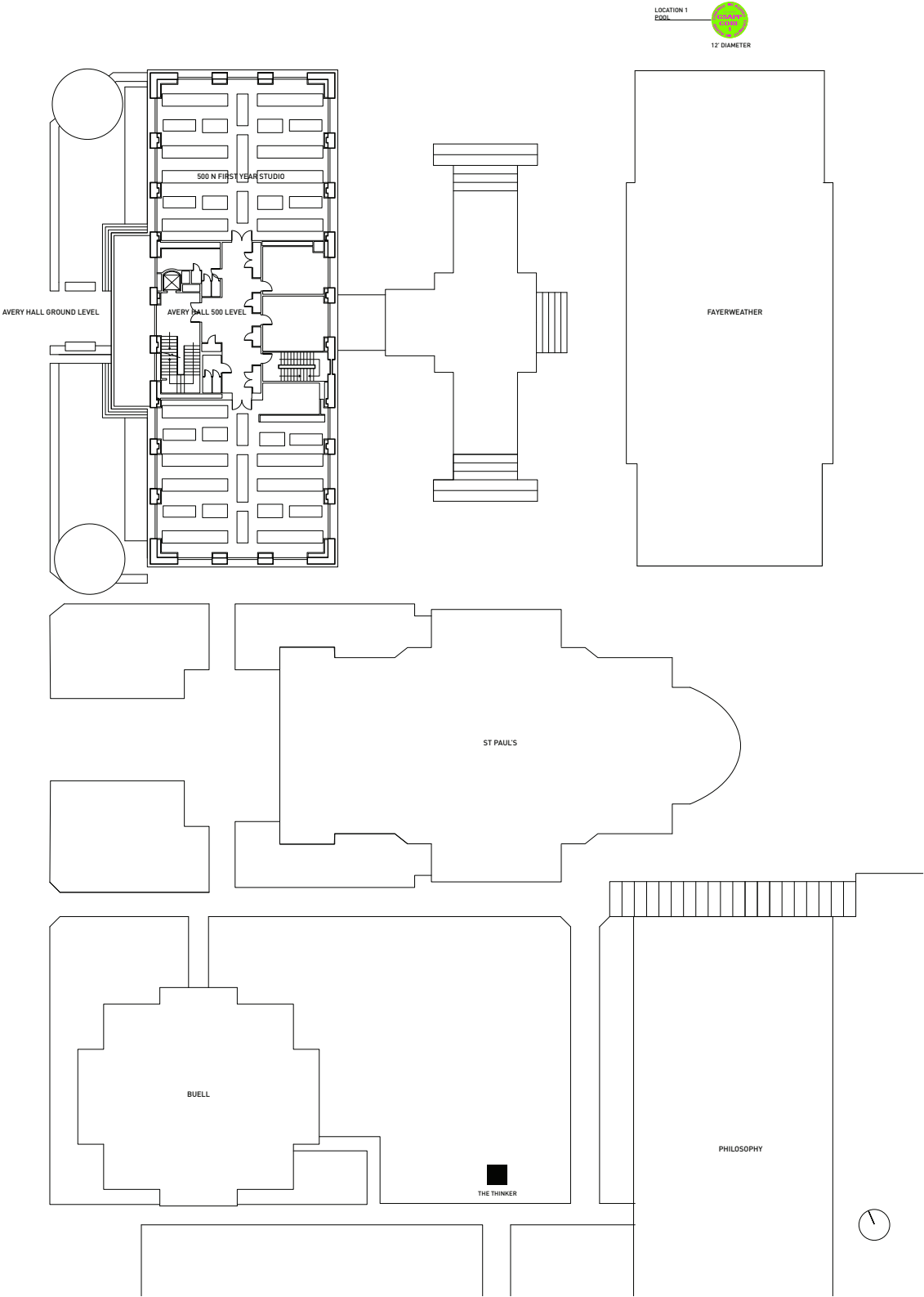
*see MODEL MAKING FACT SHEET

Janoffs
Artist and Craftsman Supplies
Canal Plastics -
Canal Rubber
Canal Street
Blick Art Supplies
Home Depot
Compleat Sculptor
Michaels

112th + Broadway
125th + Adam Clayton Powel Blvd.
Canal Street / 14st - 1 Train
Canal Street / 14st - 1 Train
Canal Street / 14st - 1 Train
Manhattan
Manhattan
Houston Stop - 1 train
100th + Columbus

MAIDEN VOYAGE

>



UNDER

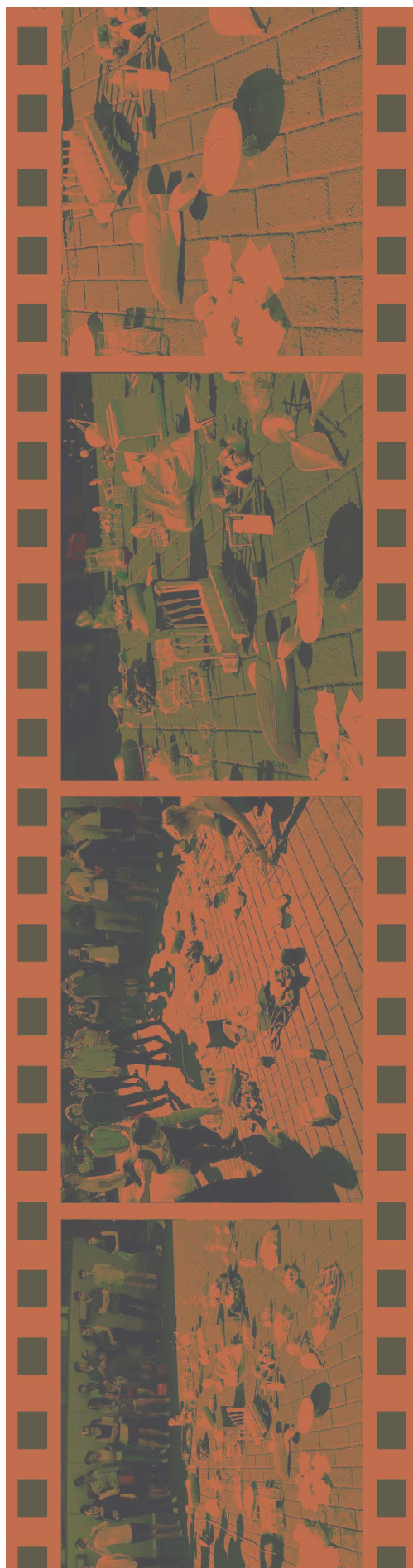
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