

## Architectural Drawing + Representation I

### Instructors:

Josh Uhl (jdu1@columbia.edu), Danil Nagy (dn2116@columbia.edu), Farzin Lotfi-Jam (fl2307@columbia.edu), Bika Rebek (br2428@columbia.edu)

*“Drawing, whether done by hand or using sophisticated computer software, can be either descriptive or prescriptive. If descriptive drawings can be subjective (impressionist, expressionist, and so forth) or objective (“technical” or “analytical”), prescriptive drawings are intended to be operative; they are manifestos of sorts. They are devices for thinking as well as for presenting positions.”*

- Bernard Tschumi, *Operative Drawing*, *The Activist Drawing*

Architects do not make buildings; we make drawings. Our drawings can be prescriptive when they are generated to convey a particular set of formal relationships, and they can be descriptive when they act as tools used to interrogate adjacencies and spatial conditions. In either case, a well-crafted drawing becomes a feedback loop for the architect, allowing one to interrogate their design, respond to the drawing, and further their proposal.

Architecture’s history of projection-based representation developed a certain level of stasis in its evolution over the last half a century. However, recent shifts to a ‘paperless’ architecture continue to have a profound impact on the field of architecture and its modes of representation and analysis. Beyond severing the longstanding relationship of the line to paper, the extraction of the vector to a virtual realm is accompanied by a simultaneous influx of data. Tools like *Building Information Modeling* and other parametric based modes of practice have saturated our methods of representation with a significant amount of information.

With this new data saturation, the position of the architectural drawing is in flux. The field of architecture is slowly moving away from its longstanding roots of projection based representation and drawing, in favor of a virtual model. The embedded data within the virtual model anticipates a certain adaptability or temporal quality which stands at odds with the fixity of traditional techniques. In this context, our historical techniques of communication have become an afterthought rather than the primary vehicles of spatial interrogation and communication. While longstanding methods such as plan, section, and elevation have remained, they have assumed a compromised, almost secondary, position. New tools of architectural investigation have made spatial inquiry so fluid and ubiquitous, that much of the field’s representation has gone the way of fast food; quickly made, and lacking much nutritional value. Understanding this shift might lead a critic towards a nostalgic longing for the historical modes of representation. Instead, we propose to investigate the alternate scenario.

In this course, we will engage drawing's new temporal nature and try to harness its potential. What does it mean to make a drawing in the 'Post-Projection' era? What is lost when an understanding of the constructed nature of a drawing is gone and the tools of projection are relegated to a secondary role? What can be gained through understanding these tools more completely and then re-appropriating them in contemporary investigations?

*Architectural Drawing + Representation* will investigate the current concepts, techniques, and working methods of computer aided 'drawings' in architecture. The focus of the course will be the *construction* of architectural representations. However, rather than just experimenting in technique, the course will encourage one to define how these new operative techniques are changing the role of drawing in architecture. To this end, we will study the operative relationship between 2d and 3d data, exploring the reaches of their analytic and representational potential. While the class is a foundational course in architectural computing, it will build on the student's advanced ability to question, shape, and interrogate space and time. In doing so, the goal will be to reassert the speculative nature of representation in the creation of conceptual, provocative, and data-filled drawings.

The full-semester course will be focused on a project that is generated primarily with the use of Rhinoceros and 3dsMax. After the initial development of a virtual model, we will investigate tools to further the analytic and representational capacity of the data within the model. Studies will be in the form of drawings, physical models, images, and animations. There will be one assignment with 4 milestones. Each of these milestones will be posted on the class web page for grading.

As a companion to the course lectures on Wednesdays, the class will have weekly Tutorial Sessions and weekly Desk Crits.

Tutorials are two hour 'hands-on' sessions led by a video tutorial with one-on-one assistance by the course TAs. The tutorials will cover the concepts and techniques covered in the course lectures. However, the specific content of the tutorial assignments will only be covered during the tutorial sessions. Tutorial times will be coordinated with your class TA and will start the second week of classes.

Desk Crits are weekly two hour sessions organized by your assigned course instructor. This weekly meeting will be comprised of desk crits or pinups in response to the specific needs of the class as deemed by the individual instructors. They will occur as follows for each instructor:

**Uhl** – Mondays, 115 Avery, 9-11am

**Nagy** – Mondays, 300 Buell N, 9-11am

**Lotfi-Jam** – Mondays, 200 Buell N, 9-11am

**Rebek** – Mondays, 201 Fayerweather, 9-11am

For the course assignment, each student will choose a building from the provided list. Alternate buildings are discouraged, but will be considered on a case by case basis and determined by the compelling nature of your argument. Each of the assignments will be reviewed in either desk crits or pin up and posted on the class web page for grading.

**Grades will be based on the following criteria:**

- 05% Assignment 1A – Research Assignment
- 25% Assignment 1B – Drawings
- 25% Assignment 1C – Fabrication/Model
- 30% Assignment 1D – Animation/Drawings
- 15% Attendance and Participation (including tutorials)

**Requirements for the course:**

- Attendance at the lectures, tutorials, seminars, pinups and desk crits
- Completion of the four assignments, includes the online posting and course pinups/review.

**Recommended Reading:**

There are no required textbooks for the course. There are recommended readings as a companion to the course lectures and discussion. The readings are excerpts from the books below. The recommended excerpt will be posted on the university's *Courseworks/Canvas* site. Also listed below are a few books which are recommended if you have not interacted with them in your education.

*The Activist Drawing: Retracing Situationist Architectures from Constant's New Babylon to Beyond*, Catherine de Zegher and Mark Wigley, editors

*Architectural Geometry*, by Helmut Pottmann, Andreas Asperl, Michael Hofer, Axel Kilian

*Architecture: Action and Plan*, Peter Cook

*The Changing of the Avant-Garde: Visionary Architectural Drawings from the Howard Gilman Collection*,

Contributions by Terence Riley, Sarah Deyong, Marco De Michelis, Pierre Apraxine, Paola Antonelli, Tina di Carlo, Bevin Cline

*Contested Symmetries and Other Predicaments in Architecture*, Preston Scott Cohen

*Data Flow: Visualizing Information in Graphic Design*, Robert Klanten, editor

*Diamond Catalogue*, Essay by John Hejduk

*Drawing: the Motive Force of Architecture*, Peter Cook

*Elements of Descriptive Geometry*, George Warren, George Blessing, and Lewis Darling

*Envisioning Architecture: Drawings from the Museum of Modern Art*, by Matilda McQuaid

*Envisioning Information*, Edward R. Tufte

*Mappings*, edited by Denis Cosgrove (James Corner's essay, *Agency of Mapping*)

*Pamphlet Architecture 1-10*, Princeton Architectural Press

*Perfect Acts of Architecture*, Jeffrey Kipnis

*Points + Lines: Diagrams and Projects for the City*, Stan Allen

*Practice: Architecture, Technique and Representation*, Stan Allen

*The Projective Cast: Architecture and Its Three Geometries*, Robin Evans

*Scripting Cultures*, Mark Burry

*Translations From Drawing to Building*, Robin Evans

*Visual Explanations*, Edward R. Tufte

## Architectural Drawing + Representation I

### ADR1 SCHEDULE:

Wk	Date	Lectures – Mondays 11am-1pm, Wood Auditorium	Tutorials
1	Sept 9-10	Digital Primer Weekend Workshop I: LECTURE: The Architectural Drawing + Course Introduction DEMONSTRATION: Plans, Sections, Perspectives - Basic drawing, modeling and representation in Rhino + Adobe CS	Barcelona Pavilion
2	Sept 11	LECTURE: Free Form Curves and Surfaces DEMONSTRATION: Non Uniform Rational B-Splines - Rhino 2D/3D & Surfaces ASSIGNMENT 1A DUE	Panton Chair
3	Sept 18	LECTURE: Pixels, Points, and Vectors: The Anatomy of a Drawing (Plans, Sections, Perspectives)	Pantheon Section
4	Sept 25	LECTURE: Meshes DEMONSTRATION: 3dsmax: 2D/3D + Meshes and Subdivision surfaces	Subdivision Mesh Airplane
5	Oct 02	LECTURE: Drawing an Argument (Architectural Thoughts and Representation)	Barcelona Chair
6	Oct 09	LECTURE: Parametrics DEMONSTRATION: Parametrics (Max/Grasshopper)	Parametric Facades
	Oct 14-15	Digital Primer Weekend Workshop II: Drawing Conventions: techniques+intention	
7	Oct 16	DRAWING REVIEW - ASSIGNMENT 1B DUE	
8	Oct 23	LECTURE: Fabrication and Rationalization DEMONSTRATION: Modeling and Rationalization for physical model making	Bubble Pavilion
9	Oct 30	LECTURE: Light, Shadow & Composition + Color, Material & Layering DEMONSTRATION: Lighting, Materiality and Texture	Barcelona Pav. Lighting
10	Nov 06	Election Day Holiday – No Class	Barcelona Pav. Materials
11	Nov 13	MODEL REVIEW - ASSIGNMENT 1C DUE	
12	Nov 20	LECTURE: Time and Architecture Story Boards – Narratives of Architecture DEMONSTRATION: Analysis and Animation	Animation Tutorial + Story Boards
13	Nov 27	DEMONSTRATION: Compositing the Image	After Effects Compositing
15	Dec 15	FINAL - ASSIGNMENT 1D DUE	

## Architectural Drawing + Representation I

### Assignment(s)

**Instructors:** Joshua Uhl, Danil Nagy, Farzin Lotfi-Jam, and Bika Rebek

*“The second meaning of the word 'drawing' - to pull - points to this essential meaning of the drawing as a means of pulling out, revealing and concretizing internal mental images and feelings as much as recording an external world.”*

*- Juhani Pallasmaa, The Thinking Hand*

### Assignment 1 – The Architectural Detail

Drawing and representation has always taken on a multitude of roles within architecture, from technical description and representation to radical proposals and flights of the imagination. In recent decades, the role of architectural drawing has been further confounded by the appearance of new digital tools, which have downplayed the utility of two dimensional drawing in favor of three dimensional and time-based representations. While these tools have allowed radical new possibilities for representation, they have also effectively divorced our bodies and sense of touch from the process of design, making it a wholly visual process. The goal of the class will be to critically investigate the continuing role of representation within architecture, exploring both its traditional uses in light of new tools, and how these tools can lead to radically new methods of design and exploration.

For this assignment, each student will select a building from the provided list of buildings and projects. An initial analysis will include research of plans, sections, and detail drawings of the building in order to understand it as a system linking ideas of form, function, and structure, and transcending various scales from the detail to its context within the city. Each student will then select a specific detail within the building for further exploration.

Within the study of an architectural detail, one will often find the genetic make-up of its larger context. Isolation and abstraction of the minute allows one to re-evaluate the larger whole and understand it in a new way. In most cases, the context of the detail will be critical for the analysis. Therefore, the entirety or a majority of the building will need to be modeled through the course of the semester in order to complete the assignment. Students are encouraged to be creative regarding the definition of a detail, as well as the meaning and value of the images they produce.

The assignment will consist of four parts, each asking the student to study their chosen building and detail using a specific form of representation. The act of sketching will serve as a unifying base and strategy for the course. Along with the assignments, students will be asked to submit sketches that show the development of their concepts and the intention behind their finished work.

### **Assignment 1a: Research**

*Due September 11<sup>th</sup>, posted to the class website and printed for review*

The first assignment will familiarize you with your building, help you focus on the detail you want to investigate, and allow you to start exploring different forms of representation. Specific requirements of the first assignment are:

- Three (3) original sketches that study your project at the scale of the detail, the building, and its context.
- Two (2) 11x17 tiled boards with scanned plans, sections, elevations, detail sections and perspective imagery of your building.
- Use original documents as much as possible, using the Avery Library as your main resource.

### **Assignment 1b: Projection**

*Due October 16<sup>th</sup>, posted to the class website and printed for review.*

The second assignment focuses on creating two dimensional representations of the building detail. Using your knowledge of projection along with techniques of composite drawing, rendering, and vector export, you will create both an immersive perspective section and exploded axonometric diagram. Emphasis should be placed on developing smart drawings that reveal the concept of the building and trajectory of the analysis, with composition and drawing clarity carefully considered.

At this milestone, your digital model should be near completion, developed enough to be mined for vectors and pixels in the pursuit of extraordinary analysis drawings. The images produced should convey the system under study as an isolated variable, as well as how that system relates to the rest of the building. Specific requirement of the second assignment are:

- At least one sketch for each drawing showing how the concept of the drawing was developed and the information you intended to show
- One (1) 3000 x 3000 pixel (min.) annotated exploded axonometric analysis diagram using proper line weight, type, and color to show the structure and interrelationship of the detail's geometry
- One (1) 3000 x 3000 (min.) pixel immersive sectional perspective using rendering techniques to show spatial characteristics through careful use of light and shadow, color, and texture

### **Assignment 1c: Model**

*Due November 13<sup>th</sup>\*, images posted to the class website and models displayed for the review (\* an interim deadline for laser cutting and 3d printing will be established one week before the assignment deadline)*

The third assignment is to create a physical model of the building detail (or a portion of that detail) by creating a scaled assemblage with the laser cutter and/or the 3D printer. You may consider integrating both technologies or developing a model by hand with the aid of those tools. Students should consider employing transparency, unfolding, and sectioning as operative techniques in the composition of the model. Additionally, connectivity of the parts should be studied. Can you develop a system of connections which eliminates the needs for adhesives?

The model is not intended to be a direct or exact translation of your building (although this is an option if you choose). When switching scales, a different system of connectivity will inevitably need to be designed in order to accommodate this size shift. Therefore, the techniques utilized to export the virtual data for the creation of the physical model should be studied as a design problem. In the process of this abstraction, careful consideration should be given to the model's representation and the construction methods you employ.

The scale for your model should be determined in relation to the 'idea' you are trying to convey about the project you are studying. If your building has an interesting component that you'd like to study at a much larger scale, it is certainly appropriate to model an element at a larger scale (ie. light fixture, curtain wall fixture, etc.) Alternately, if you are looking at a larger system like a space frame or truss, a much smaller scale might be appropriate. The minimum requirements of the third assignment are:

- A series of sketches showing the construction concept for the model
- One (1) 12"x12"x12" scaled physical model of building detail or system
- Three (3) images of the model posted onto the class website.

#### **Assignment 1d: Time**

*Due on or around December 15<sup>th</sup>, stills posted to the class website and animation upload to school server*

The final assignment will use time, the fourth dimension, as an opportunity to study architecture as an animate entity. The program and systems of a building often have a complex relationship to their context. These relationships are often impossible to fully understand or identify in a single instance. Concepts such as these are most effectively documented through an aggregation of imagery in order to analyze the environmental changes at play.

To study these concepts, create one (1) animated analysis movie of your detail. Techniques of abstractions such as of unfolding, sectioning, transparency, superimposition, and wide angle perspective should be employed in these studies. In addition, update your drawings from assignment 1b to add an element of time and document the discoveries you made in scripting your animation. The minimum requirements of the fourth assignment are:

- A series of sketches showing a storyboard for the final animation
- Updated versions of the two (2) 3000 x 3000 pixel images from assignment 1b
- One (1) final animation meeting the criteria covered in class

Grading for all assignments will take into account both the difficulty and the execution of the assignment, as well as timeliness of submittal. Any problems uploading or submitting work by the due date should be reported to the course instructors.

**\*\*Please note that personal projects, past and present, will not be accepted for this assignment.**

**Architectural Drawing + Representation I: Selected Buildings/Projects for the ADR Assignment**

Building	Architect	Typology	Year	Continent
Villa Paladiana	Palladio	Residential	1567	Europe
The Danteum	Giuseppe Terragni	Monument	1938	Europe
Unite D'habitation	Le Corbusier	Residential	1952	Europe
Guggenheim Museum	Frank Lloyd Wright	Museum	1959	North America
Fun Palace	Cedric Price	Utopia	1961	Europe
TWA Terminal	Eero Saarinen	Transportation	1962	North America
Berlin Philharmonic	Hans Scharoun	Cultural	1963	Europe
Vanna Venturi House	Venturi and Rauch	Residential	1964	North America
The Walking City	Ron Herron / Archigram	Utopia	1964	World
Jatiya Sangsad Bhaban (Parliament)	Louis Kahn	Civic	1965	Asia
Banco de Londres	Clorindo Testa	Civic	1966	South America
Habitat 67	Moshie Sofdie	Residential	1967	North America
Orange County Government Center	Paul Rudolph	Civic	1967	North America
US Pavilion at Expo '67	Buckminster Fuller	Pavilion	1967	North America
LoMEX	Paul Rudolph	Transportation	1968	North America
MASP	Lina Bo Bardi	Cultural	1968	South America
Saint-Pierre (Firminy)	Le Corbusier	Sacral	1971	Europe
Wall House 2	John Hejduk	Residential	1973	Europe
Centre Georges Pompidou	Piano, Rogers, Franchini	Museum	1977	Europe
The Atheneum	Richard Meier	Civic	1979	North America
SESC Pompéia	Lina Bo Bardi	Cultural	1982	South America
PA Technology Center	Richard Rogers	Commercial	1984	North America
Neue Staatsgalerie	James Stirling	Cultural	1984	Europe
Vitra Firestation	Zaha Hadid	Civic/Cultural	1993	Europe
Kunstal	OMA	Cultural	1992	Europe
Yokohama International Passenger	Foreign Office Architects	Civic/Transportation	1995	Asia
Le Fresnoy Art Center	Bernard Tschumi	Cultural	1997	Europe
Netherlands Pavilion 2000 Expo	MVRDV	Pavilion	2000	Europe
Simmons Hall	Steven Holl	Residential	2000	Europe
Blur Building	DS+R	Pavilion	2002	Europe
Kunsthau Graz	Peter Cook	Museum	2003	Europe
Phaeno Science Center	Zaha Hadid	Civic	2005	Europe
Santa Caterina Market	Enric Miralles/EBMT	Commercial/Cultural	2005	Europe
House&Atelier	Atelier Bow Wow	Residential	2005	Asia
Esplanda Studio	Tatiana Bilbao + at103	Office	2006	North America
Andalusian Institute of Biotechnology	Sol89	Commercial	2006	Europe
Kanagawa Institute of Technology	Junya Ishigami	Educational	2008	Asia
Ibere Camargo Foundation Museum	Alvaro Siza	Cultural	2008	Asia
Housing for the Fishermen of Tyre	Hashim Sarkis Studio	Residential	2008	Middle East
Prada Transformer	OMA	Theatre	2009	Asia
41 Cooper Square	Thom Mayne	Educational	2009	North America
Rolex Learning Center	SANAA	Educational	2010	Europe
Tel Aviv Museum of Art	Preston Scott Cohen	Cultural	2011	Middle East/Asia
Solo House	Office KGDVS	Residential	2017	Europe
Humanidade2012	Carla Juaçaba + Bia Lessa	Cultural	2012	South America
Francis A. Gregroy Neighborhood	David Adjaye	Cultural	2012	North America
Farming Kindergarten	Vo Trong Nghia	Educational	2013	Asia
WMS Boathouse at Clark Park	Studio Gang	Civic	2013	North America
Vault House	Johnston Marklee	Residential	2013	North America
Taichung Metropolitan Opera House	Toyo Ito	Cultural	2014	Asia
Engineering and Technology Univ. -UTECH	Grafton Architects + Shell	Educational	2015	South America
Grace Farms	SANAA	Civic	2015	North America
Taipei Performing Arts Center	OMA	Cultural	2016	Asia
Vangelos Education Center	DS+R	Educational	2017	North America
Victoria & Albert Museum	AL_A	Cultural	2017	Europe
Elbphilharmonie	Herzog & de Meuron	Cultural	2017	Europe
Beirut Terraces	Herzog & de Meuron	Residential	2017	Asia