

A4851 TECHNOLOGY IN TRANSITION

Disruption and Innovation in Architecture

FALL 2016 SEMINAR SYLLABUS

CLASS DESCRIPTION

Architectural technology is in a state of transition. From bricks and mortar to data and performance. From the merely digital to the computational. From intuitive reasoning to evidence based design. From a world where minimizing may be ceding ground to maximizing. From *Less* to *More*.

As architectural practice evolves through the most recent information and digital cycle, it is only now catching up to the disruptive innovations that a broader spectrum of technology is advancing. How does ubiquitous availability of data change architectural planning? How does quantitative evidence start to shape the stories of development – economic and strategic – and what methods are we using to harness this in practice? How do post digital tools, that enable *computation* rather than simply *representation*, impact the very foundation of creativity in the design profession



COMPUTATIONAL INFLUENCE



EVIDENCE BASED STRATEGY



RETHINKING ENERGY IMPACT

But is innovation in architecture different than other industries? How does innovation move the profession and the form of our built environment forward – a process that seems rapid and yet painfully slow all at the same time? Is innovation simply the ability to render and even fabricate a more complex shaped building? Or does it have a broader and deeper meaning to the ability for architecture to build society?

This seminar will explore some of the most disruptive innovations in architecture today. Disruption at building scale where we are moving from a digital toolset that documents, to a digital environment that computes. Disruptions in global scale issues, such as energy and productivity and the opportunity to tame climate change. Disruptions in urban density that drive city planning with predictive behavior mapping and use of social media.

A range of guest speakers will contribute to the class dialogue and give us their input from a variety of architectural and non-architectural viewpoints. Architects, fabricators, software developers and entrepreneurs will challenge us to think broadly as we review some of the professions most important critical areas for innovation. Taking the cues of firms and organizations such as *Google, Dassault Systems, Delos*, as well as architects and engineers on the cutting edge of innovation in practice today.

In addition to reading and exploring the course material, students are expected to contribute to the class dialogue each week. A semester long research project will form the basis of the class requirements, including a case study and developed research paper of a specific example of current or future disruptive

technology. Students will build their research and ideas around a critical argument for why this technology has already, or can potentially lead to a disruptive innovation in architecture and/or the broader built environment. Research will be conducted throughout the semester and students will have regular discussion with the course professor. Research reviews will be organized outside of class time directly with the professor.

CLASS INSTRUCTORS

Professor: Craig Schwitter craig.schwitter@burohappold.com.

Guest

Speakers: **Anna Dyson, CASE (Center for Architecture Science and Ecology).**

Director. dysona@rpi.edu

CASE conducts interdisciplinary research focused on next generation building technologies for a sustainable built environment. We address the need for accelerated innovation of radically new architectural systems capable of harnessing local ecological energy, and integrating better with both human and natural systems.

Colin O'Donnell, Intersection.

Chief Strategy Officer. colin.odonnell@intersection.com

Intersection is an urban experience company at the convergence of the digital and physical worlds to improve life in cities. **Intersection** is the result of a merger between Control Group and Titan, the team leading LinkNYC, and is owned by a consortium of investors including Sidewalk Labs, an Alphabet company

Anand Babu, Sidewalk Labs, An Alphabet Company.

COO. anand@sidewalklabs.com

At Sidewalk Labs, our mission is to create products that solve pressing urban problems, bridging to efficient, equitable and human cities of the future. To accomplish this, we're creating a unique, multidisciplinary team that spans engineering (software, embedded systems, materials science, mechanical), policy, product / design and marketing.

Melanie Koch, Delos.

Project Leader at Delos, founding firm leading the WELL building standard advancement in the US. melanie.koch@delos.com

As the pioneer of Wellness Real Estate™ and founder of the WELL Building Standard™, Delos is transforming our homes, offices, schools and other indoor environments by placing health and wellness at the center of design and construction decisions. The Delos platform includes technology, consulting, research, design and innovative solutions for the built environment – creating spaces that nurture and promote human health and well-being.

Pat Sapinsly, NYU.

Managing Director of Cleantech Initiatives at Urban Future Lab. pat.sap@nyu.edu

The Urban Future Lab (UFL) is New York City's hub for smart cities, smart grid and clean energy. Our space hosts several programs focused on educational, policy and market solutions to the issues of sustainability.

Chris Pyke, *Global Real Estate Sustainability Benchmarking*.
Director of research. Chris Pyke c.pyke@gresb.com

GRESB is an industry-driven organization committed to assessing the ESG performance of real assets globally, including real estate portfolios and infrastructure assets. More than 200 members, of which about 60 are pension funds and their fiduciaries, use the GRESB data in their investment management and engagement process, with a clear goal to optimize the risk/return profile of their investments.

CLASS HOURS

Class time: Thursday 7-9 pm
Office Hours: 6-7pm Thursday, or By Appointment.
Location: 300 Avery Hall.

CLASS READINGS

READINGS: INTRODUCTORY

- 1.1 "Welcome to the Third Industrial Revolution: The Mass Customization of Architecture, Practice and Education". Fisher, Thomas. *2050 Designing our Tomorrow*. 2015. Ed. Leubkeman, Chris.
- 1.2 "The Art of Prediction". Jencks, Charles. *2050 Designing our Tomorrow*. 2015. Ed. Leubkeman, Chris
- 1.3 "Putting the Freak in Freakonomics" *Super Freakonomics*. 2009. Dubner, Stephen & Levitt, Stephen. Pgs. 8-14.
- 1.4 "The Future (Probably) Isn't as Scary as You Think" August 2016. Dubner, Stephen. Freakonomics Podcast. <http://freakonomics.com/podcast>

READINGS: FROM DIGITAL TO COMPUTATIONAL

- 2.1 "Navigating the Computational Turn". Van Berkel, Ben. *Computation Works: The Building of Algorithmic Thought*. Architectural Design. March/April 2013. Ed. Brady Peters and Xavier De Kestelie
- 2.2 "Algorithmic Tectonics", Llach, Daniel. *Computation Works: The Building of Algorithmic Thought*. Architectural Design. March/April 2013. Ed. Brady Peters and Xavier De Kestelie
- 2.3 "Computational Fluid Dynamics for Architectural Design". Kajima, Sawako et al. *Computation Works: The Building of Algorithmic Thought*. Architectural Design. March/April 2013. Ed. Brady Peters and Xavier De Kestelie
- 2.4 "Design Eco-Systems". Davis, Daniel. *Computation Works: The Building of Algorithmic Thought*. Architectural Design. March/April 2013. Ed. Brady Peters and Xavier De Kestelie
- 2.5 "Computational Design Thinking – Introduction" Menges, Achim and Ahlquist, Sean. *Computational Design Thinking*. 2011. Menges, Achim and Ahlquist, Sean, ed.
- 2.6 "Algorithmic Form" Terzidis, Kostas. *Computational Design Thinking*. 2011. Menges, Achim and Ahlquist, Sean, ed.
- 2.7 "Material Computation" Architectural Design. March/April 2012. Ed. Achim Menges.

READINGS: MOBILITY AND SIMULATED BEHAVIOR

- 3.1 "Who Pays for your Coffee?" Harford, Tim. *The Undercover Economist*. 2005. Chap 1, Chap 4.
- 3.2 "The Limits of Urban Simulation: An Interview with Manuel DeLanda" *Digital Cities*. 2009. Ed. Leach, Neil.

- 3.3 "Place, Play and Privacy: Exploring Location Based Applications and Spatial Experience" Chan, Melanie. *Digital Futures & The City of Today*. Caldwell, Glenda et al.
- 3.4 "Innovative Urban Mobility Shaped by Users Through Pervasive Information and Communication Technologies" *Digital Futures & The City of Today*. Caldwell, Glenda et al.

READINGS: RETHINKING ENERGY

- 4.1 *The Architecture of the Well Tempered Environment*. Banham, Reyner. 1969. Chap 1 "An Unwarranted Apology"
- 4.2 "Healthy Humane Buildings". Lepasoon, Karin. *2050 Designing our Tomorrow*. 2015. Ed. Leubkeman, Chris.
- 4.3 "How Efficient is Energy Efficiency?" 2015. Dubner, Stephen. Freakonomics Podcast. <http://freakonomics.com/podcast>
- 4.4 "Territory: Architecture Beyond Environment". Gissen, David. *Territory*. 2010. Ed. Gissen, David.
- 4.5 "Eat me...Drink me..." Lally, Sean. *Territory*. 2010. Ed. Gissen, David.
- 4.6 "Sustainability Beyond Good Intentions". Braungart, Michael. *Reporting From the Front: Venice Architectural Biennale*. 2016. Pg. 92-95.
- 4.7 *The Upcycle*. McDonough, William and Braungart, Michael. 2013. Chapter 1 "Life Upcycles"

ADDITIONAL RESOURCES (RECOMMENDATIONS NOT REQUIREMENTS):

1. *Material Synthesis: Fusing the Physical and Computational*. May 2015. Ed. Menges, Achim.
2. *Material Computation*. March/April 2012. Ed. Menges, Achim.
3. *Architectural Technology (2nd Edition)*. Emmitt, Stephen. 2012.
4. *Makers: The New Industrial Revolution*. Anderson, Chris. 2012.
5. *Subnature: Architectures Other Environments*. Gissen, David. 2009.
6. *Ecological Urbanism*. 2013. Ed. Mostafavi, M and Doherty, G.
7. *Digital Cities*. July/August 2009. Ed. Leach, Neil.
8. *The Great Transition: Shifting From Fossil Fuels to Solar and Wind Energy*. Brown, Lester. 2015.
9. *Cradle to Cradle*. McDonough, W and Braungart, M. 2002.

CLASS RESEARCH PROJECT

Each student will develop a semester long research study on a key technology disruption in architecture. Your topic should consist of a disruptive type innovation in architectural practice. This innovation should have impact in the delivery of architectural designs, or the implication of construction methodologies.

Research topics should relate to the three groups of technology we are exploring in the class, namely 1) Digital to Computational Technology Shifts 2) Data Use and Evidence Based Approaches in Design and Planning and 3) Rethinking buildings relationships with Energy Use and Dependency.

Research should address three key areas for formulation of your thesis.

- Formulation of idea and supporting research documentation
- Case Study research explaining with the innovation is potentially disrupting.
- Argument for the scale and impact of the disruption – where could this have impact in current and future architectural applications?

Research topics will be developed by students in consultation with one on one discussions with the professor throughout the course of the semester. Research arguments and detail of approach will be required to present to the class before the end of the semester. A research report in the form of a term paper will be due at the end of the semester summarizing developed research and arguments for the disruptive quality of the technology.

It is important that you have a strong research question or point of view about the area or subject you select; it is not sufficient to simply report facts that can be found on Wikipedia. Starting point for research should be the readings and texts associated with the class. Additional resources are available via Avery Library. The class speakers should also provide you with other ideas for research paths. Feel free to contact them and ask questions during and/or after the class.

The research paper should be in the range of 2000 – 3000 words, double spaced and include images. Papers should be approximately 10-15 pages in length. Images are strongly encouraged: assume that your reader knows nothing about your topic or the geography, and help to explain it with diagrams, photos, renderings, charts or other relevant visual material. For questions on referencing and citing, consult a style manual (MLA, Chicago, Bluebook).

Papers are due electronically via Assignment on CourseWorks AND via email to craig.schwitter@burohappold.com by **1:00pm December 16th**. Please use the following naming convention when submitting electronically: TECHA4851_Research Paper 2016_Last Name_First Name (TECHA4851_Research Paper 2016_Schwitter_Craig)

GRADING

CLASS DIALOGUE	30%
RESEARCH	15%
RESEARCH PRESENTATION	15%
FINAL RESEARCH REPORT	40%

High Pass	>90%
Pass	60 – 90%
Low Pass	50 – 60%
Fail	<50

CLASS SCHEDULE AND LECTURE OUTLINE

9/8	LECTURE 1	‘More or Less. Exploring Disruptive Strategies in the Built Environment’
9/15	LECTURE 2	Digital to Computational
9/22	LECTURE 3	Digital to Computational
	GUEST:	Anna Dyson, Director of CASE (Center for Architectural Research)
9/29	LECTURE 4	Mobility and Predictive Behavior
	GUEST:	Colin O’Donnell, Chief Technology Officer, Intersection
10/6	LECTURE 5	Mobility and Predictive Behavior
10/13	LECTURE 6	Mobility and Predictive Behavior

GUEST: Anand Babu, COO, Sidewalk Labs

10/20 LECTURE 7 Rethinking Energy

GUEST: Melanie Koch, Delos.

10/27 LECTURE 8 Rethinking Energy

GUEST: Pat Sapinsley, Urban Future Lab.

11/3 LECTURE 9 Rethinking Energy

GUEST: Chris Pyke, Global Real Estate Sustainability Benchmarking.

11/10 LECTURE 10 Rethinking Energy

11/17 RESEARCH REVIEW

11/24 NO CLASS. Thanksgiving Vacation.

12/1 LECTURE 12 RESEARCH PRESENTATIONS

12/5 – 12/14 NO CLASS – FINAL REVIEWS

12/16 FINAL RESEARCH PAPER DUE AT 1pm