

## **ARCH 4232 – On Growth and Form**

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### **Course Description**

This theory course is a combination of aesthetic theory, history and digital design theory. In this series of lectures and discussions we trace digital design (or generative design) back to its early roots in Romanticism. During this period architects and scientists slowly turned to a concept of forms being grown over time instead of designed. At first only plants and animals were viewed as constantly evolving, but soon all forms were seen as sprouting from temporal processes. We will see how this idea of growing form first emerged with the debate in biology between Preformation and Epigenesis, then how it influenced the arts and philosophy. We will see how this develops into a taste for a looser, less perfect and even anti-Classical aesthetic, generally denoted by the term “picturesque,” which again develops into the far broader appreciation of the Gothic. The debates around the Gothic culminate in the brilliant works of John Ruskin who gives the argument both an aesthetic and a social basis: things and life are viewed as deeply intertwined. This becomes even clearer in the work of William Morris where social activity and intricate design seem to have fully merged. After that it is only a small step to Antoni Gaudi, who was the first architect to use generative design techniques. Gaudi worked with what we call “analogue computers;” large physical devices where material interactions result in formal configurations. This technique was brought to its apex in the ‘50s and ‘60s by the German engineer-architect Frei Otto who devised machines made of self-tightening soap film or interacting wool threads to design architecture. It is Frei Otto who coins the term “form finding,” a generative technique that today is used in digital scripting and algorithmic design techniques.

(The elective will partially follow the structure of Spuybroek’s latest book, *The Sympathy of Things*; while adding many more references and offering a broader background to the aesthetic ideas discussed in the book.)

### **Course goals**

1. A working knowledge of issues, concepts and terms necessary to engage scholarly and theoretical writings in the fields of architecture and aesthetics.
2. An ability to bridge between historical examples, theoretical arguments and design theory.
3. An ability to construct arguments by doing presentations of readings by selecting quotes, making summaries and diagramming concepts that eventually lead to the writing of a short essay.

### **Course Procedure and organization**

Lectures take place in two weekly sessions of 1.5 hours alternating by discussion weeks. Each lecture will be provided to the students by email in advance. Required readings are sent after the last lecture of each week, enabling the students ample time to prepare their presentation.

Presentations are to be in Powerpoint and should not exceed 15 minute length. Unavoidable absences are reported to the professor in advance.

### **Requirements and Grading**

1. Students need to attend all lectures and participate in discussions. During each discussion week they will prepare a short 15-minute presentation in Powerpoint. These presentations take on increasing complexity by adding extra images, diagrams and research to the presentations during the semester (50%).

2. Final exam consisting of a max. 1200-word essay as developed from the presentations (50%). This essay will be submitted on the Friday of the final exam week at noon.

### **Course schedule / topical outline**

Each topic is covered in two lectures held during one week. Each lecture week alternates with a discussion week.

1. *Bildung und Trieb: The Romantic Notions of Growth and Generation.* Introduction. Diderot's fibrous matter. Von Haller's Irritability and Sensibility. Caspar Wolff's vitalism and Blumenbach's Bildungstrieb. The Romantic obsession for monsters. Goethe's Metamorphosis of Plants: homology and the Urpflanze. Schelling: Naturphilosophie and the Ungrund. Caspar David Friedrich's mathematical sublime and Turner's dynamical sublime. Three concepts: Unbedingt, Bedingung and Ding. The vertical axis of the Sublime: abyss vs volcano.

2. *Radical Picturesque: Between the Beautiful and the Sublime.* Beauty continuous with the Ugly/Comic and Sublime/Tragic. Hartshorne's Diagram of Aesthetic Values. Matching with Schelling: the Trajectory of Beauty. The Picturesque: Hogarth's Gradual Variation. William Gilpin and the River Wye. Uvedale Price's Sudden Variation. His three feelings: Languor vs Tension vs Curiosity. Ruin vs Cottage. John Ruskin: Vital Beauty and Parasitical Sublime.

3. *The Digital Nature of Gothic: Ruskin's ideas on the Gothic.* Introduction to John Ruskin. Gothick and Gothicism. Ruskin's vitalism and anti-Classicism. The Six Characteristics of the Gothic. Changefulness and Savageness: Gradual and Sudden Variation. Craft and Design. Worringer's *Formprobleme der Gotik*. Craft vs Labor. Ruskin vs Viollet-le-Duc: active rigidity vs crystalline structure. Digital Craft: figure and configuration. Charles Babbage and the Difference Engine. Gothic Rib vs Deleuze's Fold.

4. *Textile Tectonics: How Ruskin's Concepts relate to Jones, Semper and Morris.* Ruskin's Wall-Veil and Earth-Veil. Encrustation and Drapery. Semper's *Bekleidungsprinzip* and *Stoffwechselthese*. Matter and Pattern. Owen Jones: *The Grammar of Ornament*. Seventeen types of Tessellation. Ruskin's *The Material of Ornament* and Abstract Lines. William Morris's Gothicism: active tendrils entangling. The Amazing Mr. Morris: merging Craft and Design. The Politics of Beauty.

5. *Abstraction and Sympathy: A Philosophy of Design.* William James: the Fringe and Mosaic Philosophy. Bergson's Sympathy and Intuition. Fabricism: Things In The Making. A

Short History of Sympathy: Magic, Stoicism, Synchronism. English sympathy: Hume and Smith. German sympathy: Herder, Lipps and Worringer. Theories of *Einfühlung*: Feeling-into and Feeling-with. Lipps's postural aesthetics. Worringer's *Abstraction and Empathy*. Comparing Ruskin and Whitehead.

6. *Ecology of Design: Design Theory Transcending Humans*. The separation of Polytechnique from Beaux-Arts. The Crystal Palace. Steel Classicism vs Steel Gothic: Henri Labrouste vs Hector Guimard. Art Nouveau and Arcades: Benjamin and Sloterdijk. Sleep and dreams: from dragonflies and butterflies to Dali and psychedelia. The spaceframe and Alexander Graham Bell's "Cygnet". Steel and freedom: Lissitzky, Constant, Buckminster Fuller, Price. How Foster made Steel right wing. The Technological Sublime.

7. *Growth and Form: From Analogue to Digital Design*. Haeckel and Buckminster Fuller. D'Arcy Wentworth Thompson: *On Growth and Form*. Calculating form: *Formfindungs* vs *Formgebung*. Gaudi's hanging catenary models. Frei Otto's soap-film and wool-thread models. Four ontologies of design: Idea, Schema, Diagram and Code. Computing the generative. The concept of the diagram as a machine and process. Back to Bildung and Trieb. Again: Fibers Fold.

8. *Digital Craft: Fabrication and Materiality*. Contemporary digital design techniques. The debate between formalism (Hadid, Lynn) and constructivism (Spuybroek, Menges). Digital design and its flaws: lack of history, lack of politics. What is Digital Craft? The Digital Craft Manifesto. Craft in art. The return of ornament in graphic design, product design and architecture. Production techniques. Difference between fabrication and manufacture.

### **Clauses**

- 1) Students with disabilities requiring special accommodations must obtain an accommodations letter from the ADAPTS Office [[www.adapts.gatech.edu](http://www.adapts.gatech.edu)] to ensure appropriate arrangements.
- 2) Georgia Tech aims to cultivate a community based on trust, academic integrity and honor. Students are expected to act according to the highest ethical standards. For policy information on Georgia Tech's Academic Honor Code, please see [[http://www.catalog.gatech.edu/rules\\_regulations/#18](http://www.catalog.gatech.edu/rules_regulations/#18)].
- 3) All cell phones should be turned off during class and when entering the classroom.
- 4) In case of emergency (i.e. fire, accident, criminal act), please call the Georgia Tech Police at 894-2500. Please note that Perry Minyard, IT Support Administrator is also a firefighter and an Emergency Medical Technician (EMT) certified in performing CPR.