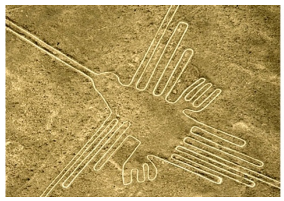
Creative Computation
COLOSSAL DRAWINGS

MIT ARCHITECTURE
ARCH 4.117/4.118
SPRING 2023
W 2:00 – 5:00
RM 3-442
CREDITS: 9 (3-0-6) g (3-0-9) ug

Syllabus

INSTRUCTORS

Brandon Clifford (Instructor) - bcliffor@mit.edu
Lavender Tessmer (Assistant Instructor) – ltessmer@mit.edu



OVERVIEW

Architecture has a deep history of integrating drawing and making, fluidly moving between the two modes. But the Albertian orthographic mandate produced a schism in this reciprocal relationship. It relegated architects to producing representations of architectural intent, relinquishing the means and methods of making to builders. With advances in digital technologies, this relationship is once again entangled. In doing so, it brings into question the renewed roles of architects, designers, creators, computers, and makers. This course disputes the default compartmentalization that is present in architectural practice today. Through the tools of computation and fabrication, the course empowers students to design as architect, engineer, and craftspeople.

This course employs modes of computation that scale from the desk to the field. It engages the timeless human act of marking the earth at a colossal scale. In doing so, students learn the fundamental principles of reciprocal computation, enabling a design process that operates in reciprocity with drawing in the field.

Students engage in a semester-long project, which is compartmentalized into shorter exercises. These exercises establish the computational rules that empower the drawing, and in turn, illuminating which advanced computational model best addresses the constraints and aides the goals of the project. These models range from recursion to parametric, genetic algorithms, particle-spring systems, and others. The goal of the course is for students to gain a fundamental understanding of how computation's role in drawing can scale from basic to complex, from the desk to the field.

INTRODUCTION

In an era when GPS, laser measurements, and lidar equipment are ubiquitous; little knowledge exists surrounding the task of scaling precise geometric operations without the reliance on advanced technology. How does one draw two parallel lines in a field with just string? What could we learn today, by looking back to moments of the past when humans were adroit in deploying string-based geometries to address landform surveys? Some precedents include the stone circles of northern Europe, the Nazca lines of South America, the Celestial alignments of Mayan cenotes, or even the crop circles of the previous century. This course builds upon a range of fundamental methods developed in the 'Crop Circle Kit' (cropcirclekit.org). Students will confront the challenges of translating rule-based geometries at their desks, into colossal drawings in the field: overcoming the incremental tolerances of the physical world at scale.

Evaluation Criteria and Grading

The following criteria will be used for the evaluation of your work, both in terms of helping your progress and in final grading:

- Investigation: How rigorous are your investigations?
- Translation of Investigation: How clear are your findings communicated in your presentation of your investigations?
- Presentation Quality: To what degree do your presentations convey what they ought to?
- Participation: How actively and how constructively are you involved in class discussions and exercises?
- Contribution: To what degree do your findings constitute a contribution to the class, field, or larger context? To what degree are those findings novel?

A: Excellent - Project surpasses expectations in terms of inventiveness, appropriateness, verbal and visual ability, conceptual rigor, craft, and personal development. Student pursues concepts and techniques above and beyond what is discussed in class.

B: Above Average - Project is thorough, well researched, diligently pursued, and successfully completed. Student pursues ideas and suggestions presented in class and puts in effort to resolve required projects. Project is complete on all levels and demonstrates potential for excellence.

C: Average - Project meets the minimum requirements. Suggestions made in class are not pursued with dedication or rigor. Project is incomplete in one or more areas.

D: Poor - Project is incomplete. Basic skills including graphic skills, modelmaking skills, verbal clarity or logic of presentation are not level appropriate. Student does not demonstrate the required design skill and knowledge base.

F: Failure - Project is unresolved. Minimum objectives are not met. Performance is not acceptable. This grade will be assigned when you have more than two unexcused absences.

Policies

Attendance at all class meetings is mandatory. If any meeting (lecture or workshop session) is to be missed, please notify the instructor prior to the scheduled class. Please remember to silence cell phones and be courteous when using laptops in class. Most importantly, be respectful and engage during fellow students' pin-ups. This course is committed to the principle of equal access. Students who need disability accommodations are encouraged to speak with the faculty member/department administrator early in the semester so that accommodations can be implemented in a timely fashion.

Undergraduates: If anything is getting in the way of your academics, please consult with S3 (s3-suppport@mit.edu). The walk-in queue is open from 10-12 and 2-4 on weekdays. Appointments can be virtual or in-person, depending on your comfort and convenience. *Graduates*: A variety of issues may impact your academic career including faculty/student relationships, funding, and interpersonal concerns. In the Office of Graduate Education (OGE), GradSupport provides consultation, coaching, and advocacy to graduate students on matters related to academic and life challenges. If you are dealing with an issue that is impacting your ability to attend class, complete work, or take an exam, you may contact GradSupport by email at gradsupport@mit.edu or via phone at (617) 253-4860.

The MIT online course management system, aka Canvas, will be used exclusively in the course. Lecture handouts and exercise descriptions will be available there shortly after class is held. Students will also be submitting exercises and materials through this system and must do so by the assigned due date.

Suggested Readings

Ball, Robert S. “A Glimpse through the Corridors of Time.” *Scientific American* 13, no. 322supp (1882): 5139–5142.
Brown, Peter Lancaster. *Megaliths, Myths and Men an Introduction to Astro-Archaeology.* Blandford Press, 1976.
Carpo, Mario. “Introduction.” *The Alphabet and the Algorithm*. Cambridge, MA: MIT Press, 2011.
Dean, Carolyn. *A Culture of Stone : Inka Perspectives on Rock*. Durham, NC: Duke University Press, 2010.
Emmons, Paul and Jonathan Foote “Making Plans: Alberti’s Ichnography as Cultural Artefact.” In Sharr, Adam. *Reading Architecture and Culture: Researching Buildings, Spaces and Documents*. London: Taylor and Francis, 2012.
Emmons, Paul. “Footprint Plans.” *Drawing Imagining Building : Embodiment in Architectural Design Practices*. Abingdon, Oxon ;: Routledge, 2019.
Heggie, D. C. *Megalithic Science : Ancient Mathematics and Astronomy in North-West Europe*. New York, N.Y: Thames and Hudson, 1981.
Humboldt, Alexander Von. *Cosmos: A Sketch of A Physical Description of the Universe*. New York: Harper & Brothers Publishers, 1866.
Thibaut, G. *The Śulvasūtras.* Calcutta: C.B. Lewis, Baptist Mission Press, 1875.
Thom, Alexander. *Megalithic Lunar Observatories*. Oxford: Clarendon Press, 1971.
Thom, Alexander. *Megalithic Sites in Britain*. Oxford: Clarendon Press, 1967.

Schedule

2/8	Introduction	Ex. 0
2/15	Field Day – True North	Ex. 1
2/22	Desk Workshop	Ex. 2
3/1	Field Day – Drawings	
3/8	Parametric Workshop	Ex. 3
3/15	**Midterm** – Para-Presentations	Ex. 4
3/22	Field Day – Drawings 2	
3/29	HOLIDAY – Spring Break	
4/5	Computation Workshop	
4/12	Field Day – Drawings 3	
4/19	TBD	
4/26	**Penultimate** – Draft Presentations	Ex. 5
5/3	TBD	
5/10	Optional Resource Day	
5/???	**FINAL REVIEW** – 1:00PM-5:00PM (*tentatively*)	