

Design Frontiers In Biology and Materiality

Instructor: Amanda Parkes (amanda@media.mit.edu)

Tues 3:30pm to 6pm in 406

H79.2816.1

Biological organisms and systems are essentially living machines. Digital technologies allow us to create a control structure with computational predictability and precision. What happens, however, when designers begin to incorporate the self-determined internal control structure of a biological system as part of a design strategy? This course offers a new approach to materiality, positing that all matter is dynamic but exists within a continuum of control ranging from passively temporal (wood, water) to electronically active (photovoltaics, thermochromics) to biologically alive (plants, tissue). This course presents alternative design strategies for creating computational interfacing with living matter and state change of natural materials. Students are introduced to the world of the bio lab from a designer's perspective, both conceptually and practically. We examine the state-of-the-art in artistic experimentation with biological systems such as the genetic manipulation projects of Eduardo Kac, or the carbon nanotubes grown into architectural structures of Ryan Wartena. We will also examine more DIY approaches to living systems integration and interactivity with biological systems. Students use a hands-on approach in their design process, with biological sensing as input and indicators or material state change as an alternative method of information display, for example. This course is designed to further our computational relationship with the natural world pushing forward ideas in sustainability, interactivity, energy production and the emerging relationship between the designer/artist and the bio lab, approaching biology as an open frontier for digital design.

Structure: The course will be a mixture of design work- including physical building, electronics and bio experimentation, along with lectures, readings, discussion and critique. Students will be introduced to a number of fabrication techniques, bio design processes and new materials, and expected to produce physical prototypes for assignments. Through a combination of producing objects and engaging in critical reflection, students will be encouraged to develop a design practice which innovates technically in process and materials as well as situates their work in the context of contemporary culture and technology. Together with physical practice, students will document and share their projects through blogging and on-line social networks.

Grading:

Class attendance, participation & reading discussion 15%

Blogging & Documentation 15%

Weekly Assignments & Design Sketches 20%

Midterm Project 20%

Final Project 30%

Schedule

January 25 Class 1 : Introduction

overview of the course the biological material continuum & control structures phenomenology as an approach to interface and interaction

Assignment: Recreate a favorite childhood science fair project as a personal statement. No baking soda volcanoes.

Readings: Phenomenology & Transformation

Demo: DNA extraction of strawberries

February 1 Class 2: Phenomenology & Transformation

Discussion: Science Project Assignment

Guest Speaker: Ari Meisel, LEED, expert in green building materials

Assignment: Science fair projects con't, using a phenomenological approach to a computational interaction

February 8 Class 3 Smart Materials and Interaction

observation & temporality: slow media

smart materials, thermochromics, nitinol

Presentations: Science Fair Projects with computational interaction
Assignment: Do a 5-7 minute presentation on your chosen bioartist.

February 15: Bio Art & the Bio Body

bio-hacking
transgenic aesthetics
genetic manipulation
Presentation of bio artists
Readings: Jans Hauser, Eduardo Kac

February 22 Class 4 : Synthetic Biology I

Genomes & bio building blocks
Assignment: Midterm Projects

March 1: Class 5: Field Trip: Genspace @ MEx

March 8 Class 6: Midterm Project Presentations (may happen on March 11, TBD)

March 15: Spring Break

March 22 Class 7: Materialized Energy - alternatives & production methods

piezo electrics
photovoltaics
biofuels & biobatteries
Guest Speaker: Eitan Zeira, vice president, Konarka Technologies
Assignment: Printed Solar panel assemblage

April 5 Class 9: Synthetic Biology II

Systems and Infrastructures: Utopias, Dystopias, and urban interventions
Readings: TBA

March 29 Class 8: Materialized Energy II

Guest speaker: Ryan Wartena, nanotubules, solar and DIY batteries
Presentations: Flexible solar designs
Assignment: Final Project Proposals

April 12 Class 10: De-technologizing through biology

environmental sensing methods
slower, bigger, cheaper
Guest Speaker: Rich Fletcher
Final project proposal discussions

April 19 Class 11: Bioethics, Intellectual Property, Open Source Biology

Assignment: Final Projects

April 26 Class 12: : Final Project Discussion + individual progress crits

Assignments: Final Projects

May 3 Class 13: Final Project Presentations & Critique

References & Resources

Exploratorium Digital Library <http://hypatia.exploratorium.edu:8080/Cumulus/Standard/SelectCatalog2.jsp>

Wall Street Journal on "biohacking" <http://online.wsj.com/article/SB124207326903607931.html>

AP on DIYbio http://www.huffingtonpost.com/2008/12/25/do-it-yourself-dna-amateur_n_153489.html

Seed Magazine: The Biohacking Hobbyist

http://seedmagazine.com/news/2008/12/the_biohacking_hobbyist.php

New Yorker: A Life of Its Own http://www.newyorker.com/reporting/2009/09/28/090928fa_fact_specter

VivoArts School for Transgenic Aesthetics <http://vastal.waag.org/>

Nature Biotechnology: From synthetic biology to biohacking: are we prepared?

<http://www.nature.com/nbt/journal/v27/n12/full/nbt1209-1109.html>

The New Atlantis: The Promise and Perils of Synthetic Biology

<http://www.thenewatlantis.com/publications/the-promise-and-perils-of-synthetic-biology>

International Association of Synthetic Biology <http://www.ia-sb.eu/go/synthetic-biology/synthetic-biology/biosafety-biosecurity/>

FBI Biosecurity Conference

http://cstsp.aas.org/Building_Bridges_Around_Building_Genomes/relevantArticles.html

George Gessert:

http://www.viewingspace.com/genetics_culture/pages_genetics_culture/gc_w02/gc_w02_gessert.htm

Catts, Oron (2002) Ed. The Aesthetics of Care, pub. SymbioticA, U.W.A. ISBN 1 74052 080 7. 1st Edition 2002, 2nd edition 2004.

Tactical Biopolitics Art, Activism, and Technoscience, edited by Beatriz da Costa and Kavita Philip, The MIT Press, 2008.

Art in the Biotech Era, edited by Melentje Pandilovski 2006

Kac, Eduardo. Signs of Life: Bio Art and Beyond (Cambridge: MIT Press/Leonardo Books, 2007).

Jens Hauser (ed.). sk-interfaces. Exploding borders - creating membranes in art, technology and society. Liverpool: University of Liverpool Press 2008 Oron Catts, Ionat Zurr Semi-Livings as Agents of Irony in Performance and Technology: Practices of Virtual Embodiment and Interactivity' Palgrave/Macmillan publication, edited by Sue Broadhurst. 2005

Art et Biotechnologies, edited by Louise Poissant and Ernestine Daubner, Presses de l'Université du Québec 2005

BioMediale: Contemporary Society and Genomic Culture book edited and curated by Dmitry Bulatov. Published by The National Centre for Contemporary Arts (Kaliningrad Branch, Russia) 2004.

Oron Catts The Art of the Semi-Living in Live: Art and Performance, Tate Publishing 2004

L'art Biotech, Edited by Jens Hauser Le lieu unique France, 2003