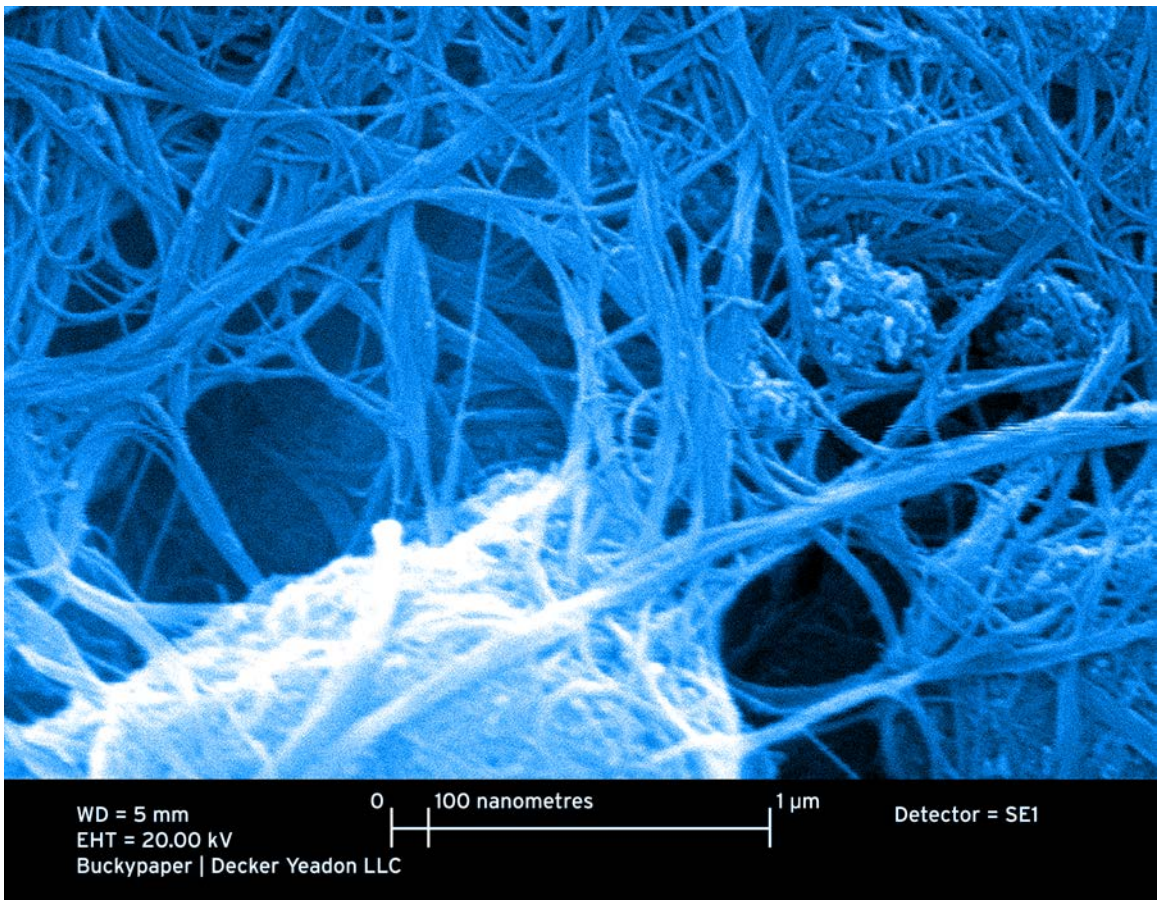

STIMULUS PACKAGE

ARCH 5110: ARCHITECTURE AS CATALYST
MARCH 10–14, 2014

Course Description
A 1-credit, pass/fail graduate design workshop that investigates responsive material technologies

Guest Instructors
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Host Instructor
Blaine Brownell
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"Looking more to the future, many of the most exciting areas of innovation in both products and environments (architectural, vehicular) can be captured with words such as interactivity, smartness, and intelligence. Interactive systems or environments involve a response to the action of a user. Smart or intelligent systems or environments have their strongest basis in complex sensor-based electronic and computational systems, but many rely on the characteristics of property-changing smart materials as well."

Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek, *Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects*, (Oxford: Elsevier Ltd, 2009), 333

Course Description

Recent developments in materials science offer tremendous opportunities for invention. This is particularly so with smart materials and nanomaterials that react to changes that they "sense" in their environment. From materials that change color, fluidity, and shape, to substances that generate electricity and emit light, the novel properties of emergent materials offer an increasingly broad array of opportunities to contemporary architects and designers.

We are at the beginning of a new epoch, for which there are few precedents for architects, however it is not unfamiliar territory. The age of electricity, the machine age, the space age, and the information age all produced extraordinary works by artists and designers that lent vision to the problems and promises of new technologies. Encouraged by this tradition of leadership, the intent of this workshop is to conceive of how architecture might be transformed by advanced materials that are just emerging in the field.

We can no longer think of materials as just being static, and as resources that must be cut, shaped, cast, blown, printed, or formed into products and devices. In our age, where the domestication of atoms has led to the design of materials at the molecular scale, researchers are fundamentally altering the properties of matter, and our relationship to it. Now, materials ***are*** devices, and react with behaviors that we have bestowed upon them.

Smart materials, for example, will show a significant change in one or more of their properties when they are stimulated. A variety of external stimuli can cause these materials to change color, shape, fluidity, etc.; the stimulus might be thermal, electrical, mechanical, chemical, magnetic, or photonic. The changes in the properties of smart materials are deeply rooted in the nanoscale – the scale of individual molecules – and are often a direct result of chemical reactions or phase changes.

As architects shift away from the mores of merely reinventing artifacts, and toward a culture of discovery and invention, they will need to think about how advanced materials should be designed to ***behave*** in products and environments that heretofore have never been possible. By exploring relationships between smart materials and more conventional material systems, this workshop, **Stimulus Package**, examines the promises of smart materials and their tremendous implications for the future of architecture.

Students will learn about smart materials through demonstrations, presentations, and hands-on engagement with a selection of smart materials. We will not only explore the remarkable capabilities of these materials, but also their limitations. After an initial experimentation phase is completed, our class will embark on the creation of performative artifacts that demonstrate how the behavior of these responsive materials might both stimulate and enchant the senses of one that encounters them.

You will be provided with a package that contains a few different classes of smart materials. Working in teams, students will design and make an object of their own invention that exploits the properties of these materials, which are engineered to change shape, change color, and emit light. Your design must consider how the behavior of these responsive materials might engage the senses, and your solution must necessitate the use of the smart material.

Learning Objectives

You will have opportunities to rigorously examine a number of issues. Students will be expected to execute and present research on smart material technologies and develop convincing design propositions that make use of smart materials. You will be provided information, through presentations, discussions, readings, reviews, and demonstrations, to allow you to focus on these objectives:

- to develop an awareness and knowledge of smart materials: what they are, how they perform, and what they can do,
- to develop an appreciation of the broad design implications of these emerging technologies,
- to identify, and develop an appreciation for, a broad range of works by architects and designers that have envisioned opportunities that these technologies present,
- to contemplate new design applications for smart materials, applications that might exploit their unique properties and, at the same time, might help us address particular issues,
- to develop design propositions that are reasonable and convincing arguments based on research and evidence,
- to develop innovative design works that elegantly, and appropriately, make use of the materials studied in this course,

- to develop an independent sense of experimentation and scrutiny, yet participate in critical discourse,
- and, to develop effective representation and communication skills that are highly-accomplished.

Schedule

3.10 Monday
09:00 Catalyst Kick-off (Rapson courtyard), followed by Stimulus Package group meeting (Rapson 225)
12:00 Lecture: Maureen Cummins (Rapson 54)
13:30-17:30 Studio: experimentation and concept design (studio desks, workshop)
18:00 Lecture: Decker Yeadon (Bell Museum Auditorium)

3.11 Tuesday
09:00-11:00 Pin-up: concept design (Rapson courtyard)
11:00-17:30 Studio (studio desks, workshop)
18:00 Lecture: Andrea Ponsi (Rapson 100)

3.12 Wednesday
9:00-11:00 Pin-up: schematic design (Rapson courtyard)
11:00-17:30 Studio (studio desks, workshop)
12:15 Lecture: Barry Kudrowitz (Rapson 43)
18:00 Lecture: Randy Ewoldt (Bell Museum Auditorium)

3.13 Thursday
9:00-11:00 Check-in with individual groups: design development (Rapson courtyard)
11:00-17:30 Studio (studio desks, workshop)
18:00 Lecture: Michael Schumacher (Rapson 100)

3.14 Friday
10:00-11:00 Check-in: informal group review and discussion (HGA gallery or Rapson courtyard)
14:00 Catalyst Final Show Exhibition and Presentations (Rapson courtyard)

Documentation

Documentation of the entire work of the workshop will be required. You will be invited to join a free Dropbox folder, which you will use to submit the required documentation. The documentation files are due in the Dropbox folder before the final work is presented or made public.

This documentation will provide the department with a review of your study, and information contained in the files might be used in future electronic or printed media publications, either in whole or in part. This record will also enable others to have access to your work in the future. Please be advised that it is highly recommended that you make a copy of the files for your own records.
You will find that the Dropbox contains folders for each team. You are to place your documentation for each project in the appropriate folder. The documentation submission has the following requirements:

- Each of team folder should contain four folders titled: IMAGES, PRESENTATION, RESEARCH, and TEXT.
- In the first folder, IMAGES, you are to place high-resolution images of the work that was submitted, and any movies. Each image is to be a 72 ppi/dpi JPEG, at maximum quality (i.e. compression value 10 or 12). The longest dimension of each image, horizontal or vertical, must not be less than 3600 pixels (i.e., 12 inches at 300 ppi). When you title each image file, simply number the file (i.e., 01.jpg, 02.jpg, 03.jpg, 04.jpg, 05.jpg ...). Any movies that are submitted must be saved as High Definition MOV, or MPEG-4, or AVI files, minimum 1024x768 resolution.
- In the second folder, PRESENTATION, you are to include a copy of any PowerPoint, Keynote, PDF, or similar presentation files that were made. Test your presentation on someone else's computer; broken presentation links are not acceptable.
- In the third folder, RESEARCH, you are to place comprehensive PDF documentation of the precedents, technologies and materials that you researched and presented. A bibliography and hyperlinks to internet content should also be included in a PDF or MSWord (.doc) file that

summarizes the resources you referenced. Test your file on someone else's computer; broken links are not acceptable.
- In the last folder, TEXT, you are to place a 300-400 word text description of your project in MSWord (.doc or .docx) format. This text may be quoted by the media, so please ensure you proofread it.

READINGS AND RESOURCES

A portion of this course is devoted to the study of relevant literature on smart materials. Specific documents will be issued. In addition to these texts, there are a number of important books that have been placed on reserve in the Library for you to inspect, listed below:

- Rashida Ng and Sneha Patel, eds. Performative Materials in Architecture and Design. Bristol, UK & Chicago: Intellect Ltd. & University of Chicago Press. ©2013.
- Gail Peter Borden and Michael Meredith, eds. Matter : material processes in architectural production. London, New York: Routledge. ©2012.
- Philip Howes and Zoe Laughlin. Material Matters : new materials in design. London: Black Dog Publishing. ©2012.
- Thomas Schropfer. Material Design : informing architecture by materiality. Basel: Birkhäuser. ©2011.
- Elodie Ternaux. Material World 3 : innovative materials for architecture and design. Amsterdam: Frame Publishers; Minneapolis, MN: Consortium Book Sales & Distribution. ©2011.
- Blaine Brownell. Transmaterial 3: a catalogue of materials that redefine our physical environment. New York: Princeton Architectural Press. ©2010.
- Michael Fox and Miles Kemp. Interactive Architecture. New York: Princeton Architectural Press. ©2009.
- Thorsten Klooster. Smart Surfaces : and their application in architecture and design. Basel, Boston: Birkhäuser. ©2009.
- Blaine Brownell. Transmaterial 2: a catalogue of materials that redefine our physical environment. New York: Princeton Architectural Press. ©2008.
- Sylvia Leydecker. Nano Materials in architecture, interior architecture and design. Basel, Boston: Birkhäuser. ©2008.
- Katie Lloyd Thomas. Material Matters : architecture and material practice. London, New York: Routledge. ©2007.
- Axel Ritter. Smart Materials in architecture, interior architecture and design. Boston, Basel, Berlin: Birkhäuser. ©2007.
- MatériO. Material World 2 : innovative materials for architecture and design. Basel, Boston: Birkhäuser. ©2006.
- Blaine Brownell. Transmaterial: a catalogue of materials that redefine our physical environment. New York: Princeton Architectural Press. ©2006.
- Michelle Addington and Daniel Schodek. Smart Materials and Technologies: for the architecture and design professions. Oxford, UK: Elsevier Architectural Press. ©2005.
- K. Worden, W.A. Bullough & J. Haywood. Smart technologies. River Edge, N.J.: World Scientific. ©2003.
- Philip Ball. Made to Measure. Princeton, NJ: Princeton University Press. ©1997.