PORTFOLIO: TEACHING

INTRODUCTION TO TEACHING
Digital Matrix for entire School Curriculum

CORE, REQUIRED TEACHING CLASSES

Design Communications II, Arc 341
lecture and lab class for entire third year undergraduate students, 2009-12

Design Studio: Tectonics, Arc 301
design studio for third year undergraduate students

Contract Documents, Arc 441
lecture and lab class for entire fourth year undergraduates
co-taught with Patrick Hwang

Design Studio: Comprehensive Design, Arc 510f
design studio for third year graduate students

OPTION TEACHING CLASSES

BIOMIMETIC PEDAGOGY: INSTALLATION/MATERIAL SCALE
Biomimetics, Arc 481/581f (previously 497/597b)
2011 elective seminar class
2013 elective seminar class

BIOMIMETIC PEDAGOGY: BUILDING SCALE
Option Design Studios
F2011, Advanced Topics, Sustainable Skyscrapers, Arc 451 (5th year undergraduates)
S2013, Advanced Topics, Arc 402 (4th year undergraduates)

BIOMIMETIC PEDAGOGY: URBAN SCALE
Option Design Studios
S2011, Advanced Topics, Urban Form, Arc 402 (4th year undergraduates)
S2012, Advanced Topics, Urban Form, Arc 402 (4th year undergraduates)
co-convened with Dr. Ryan Peru’s graduate planning seminar one day a week
S2014, Advanced Topics, Urban Form, Arc 451a (4th year undergraduates)

INDEPENDENT STUDIES
Various Independent Studies from S2011-14

TEACHING RELATED ARTICLES AND AWARDS BEYOND RESEARCH AND SCHOLARSHIP SECTION
TREND Report on Arizona Challenge 2.0, August 2012 (Arc 402, S2012)

Part of SuckerPUNCH Publication on Biomimetics Seminar, 2013 (Arc 481/581f, S2013)

ACSA Awards Book Spread featuring received 2013-14 ACSA/AIAS New Faculty Teaching Award
Biomimetics Seminar
Arc 497b/597b, elective 3-credit seminar class, spring 2011
various level student work

This seminar course became a research lab, initially studying precedent work and processes in biomimetics, then culminating in two group projects which created original, collective fabricated work. Of the fifteen students most were third and fourth year undergraduates, with two Master of Science students. One group created ‘Data Scape’, a biomimetic surface installation, while the other group created ‘Performative Porosity’, a research project, designing an evaporative cooling wall for an arid climate with ceramic foam. All images are by various students in the class.

project 1, ‘DATA-SCAPE’, a biomimetic surface
students: Drew Allen, Cruz Crawford, Laura Huylebroeck, Tyler Jorgenson, Kevin Moore, Levi Van Buggenum and Sheehan Wachtler

INSTALLATION CONCEPT:
The desire was to create a ‘smart surface’, modelled algorithmically, that could adjust its open and closed positions based on the actuation and movement of the secondary components, by natural elements i.e. wind or human interaction. The surface starts to blur the traditional boundary of enclosure. Varying rod lengths exaggerated the movement based on two attractor points across the surface.

OPTION TEACHING CLASSES

BIOMIMETIC PEDAGOGY: INSTALLATION/MATERIAL SCALE

various images of final installation
In most building designs, walls are erected as barriers to isolate spaces: internal spaces from the outside world, internal spaces from one another and so forth. Yet spaces, if they are to be occupied and used, cannot be isolated. Resolving this paradox is what forces building designs to include infrastructure—windows, fans, ducts, air conditioning, heating etc—all essentially to undo what the erection of the walls did in the first place.

-J. Scott Turner and Rupert Soar, "Beyond Biomimicry: What termites can tell us about realizing the living building" I3CON Conference, 2008

**Installation Concept:**
The main climatic features of the Sonoran Desert are a scarcity of water and extreme heat. Related conditions to consider are low humidity and high day/night temperature fluctuations. In response to these conditions, native species offer a framework of possible strategies that can be applied to the built environment. These influences became the basis of a performative porosity exploration to design an evaporative cooling wall.

cross section: rib proximity responds to the most extreme sun position as a result of the sun’s effect on moisture and growth rates

hydrotopism: the rate of expansion, as a result of rainfall, differs on northern and southern sides of a saguaro

microscopic images of ceramic foam

3 processes for foam production: replication, burn-out and introduction of gases. chosen method: ‘replication’:

- select/prepare foam template
- select/prepare ceramic slip
- immerse foam in ceramic slip
- remove excess slip and dry
- kiln fire

considerations: viscosity vitrification temperature shrinkage rate strength thermal properties

knight burns away between 500-700 degrees fahrenheit, remaining ceramic matrix is vitrified at approximately 2000 degrees fahrenheit +

compressive strength test on different porosities

evaporative cooling test - the three samples density had little effect on cooling performance until around 15% saturation

the form is designed to increase surface area exposed to air: longer exposure equals increased cooling potential. As water is evaporated more water is drawn to the surface by way of capillary action through the micro cells of the ceramic (water in a sponge moves from wet to dry)

thermal imaging studies; comparing convulated forms and sections to flat ones

installation concept, material realities exhibit, dissemination:
Biomimetics Seminar
Arc 481b/581b, elective 3-credit seminar class, spring 2013
various level student work

"An alternative philosophical approach which does not split the world into form and matter but instead considers it in terms of force.....which all act on each other."

Katie Lloyd Thomas
Material Matters

Biomimetics is the study and application of biological principles as essential design parameters. This study goes beyond a metaphor; it is not about mimicry, but about understanding the nature of the material itself. Negotiating design and performance with engineering and fabrication has been one of the central topics of architectural discourse; driving this is a growing awareness of ecology and sustainability which this course addresses. This time the goal of the class was to create an installation relating to biomimetics for the upcoming AIA Beaux Art Ball Event, focusing on a single output for the entire class versus 2 projects. There was also a view to develop the previous class outputs to encourage installations that created architectural space, i.e. projects that created a system that could define and structure space rather than being a material study or a wall treatment as in the last iteration of the class. The class schedule broke down as follows:

Week 1 : Introduction to course and schedule
Week 2-4 : Individual/team research/presentations..... (site selected) - Assignment 1
Week 5-8 : Individuals/team design proposals – selection of ‘winner’ - Assignment 2
Week 9-14: Design development/fabrication + installation by whole class - Assignment 3

biomimetics, assignment 1 - research

After an initial introduction, students worked alone or in groups to research various selected topics by the candidate and made presentations in the following 2 weeks to the rest of the class. Research topics were:

Biomimetics (general), Biomimetics related to the humanities, Cybernetics: artificial intelligence, feedback systems, self-organization and emergence, Biological Systems - Morphogenesis, Structure/Materiality/Form relationship, Technology/Software and Precedents.

assignment 1, example of students work:
students: David Kim, Joseph Miranda and Sheehan Wachter
research topic: Biological Systems - Morphogenesis; partial submittal of research slides

biomimetics, assignment 2 - installation design proposal

Assignment 2 is about designing and making, based on the subject matter of the class. Design proposals for installations should encompass the ideas of the class and how it relates to architecture, resulting in some physical manifestation. The intended ‘site’ was the Mercado Courtyard, Tucson, AZ. (AIA Proposed Beaux Art Ball location). Students could work individually or in teams and needed to present designs, costs and scheduling projections.

assignment 2, examples of students work:
students: David Kim and Sheehan Wachter; example slides of project proposal

biomimetics, assignment 3 - design development + execution

The selected design was developed, rationalized, fabricated and assembled on site by the entire class. All the following images and drawings were created by various members of the project team, see final page of class for full credits.
The geometry of the base unit is defined in topology as an Enneper Surface, which takes the curvature of a hyperbolic paraboloid, formed by the pre-stressing of the material system. Prototypes included the testing of various materials in the elastic structural chord (polyvinyl chloride, polyethylene, polycarbonate, aluminium, steel, and fiberglass reinforced polymer) in combination with multiple composite fabric materials and stitch formations in the tensile membrane. The final material section was the combination of cross-linked polyethylene tubing (PEX) and a constraining synthetic fabric membrane, known as Power Mesh, leading to a balanced material composite. The tubing’s elastic material property gave it a high range of deformation, while the stitch of the fabric gave it equal omnidirectional tensile properties.

*images showing various fabric samples for tensile membrane, with Power Mesh on the right.*

*analog stills of surface deformation, before fabric size is decreased*

This capacity and potential for the tuning of each unit to a specified form was modeled and simulated digitally in Kangaroo, a physics simulation plugin created by Daniel Piker for McNeel’s algorithmic modeler for Rhino, Grasshopper.

*images showing three scales of analog models/prototypes built to help determine final form/clustering logic*
INSTALLATION CONCEPT:
Form specificity and topological variation was developed through the manipulation of a material system, bending and loading identical components to adapt to external forces, such as the sun, while simultaneously navigating the site, providing structure and ultimately architectural space.

LOCATION, DATE + EVENT:
University of Arizona American Institute of Architecture Students (AIAS) Beaux Art Ball, 4 May 2013 (installation was up 2-9 May 2013), Mercado San Agustín, Tucson, Arizona, USA.

PROJECT TEAM:
Instructor/critic: Assistant Professor Susannah Dickinson.
Schematic Design Team: David Kim and Sheehan Wachter.
Lighting Consultant: Molly McKnight

IMAGES:
Various Project Team members

various final images of installation:
Design Studio: Advanced Topics, Sustainable Skyscrapers
Arc 451, option 6-credit studio class, fall 2011
undergraduate fifth year student work

This studio’s intent was to study emerging directions for future sustainable skyscrapers and their relationship to people, the city and the environment. Design is becoming more holistic as we become more environmentally conscious, the aim was to see how can we incorporate sustainable/natural principles in the design of our buildings and environments? Students needed to see buildings less as individual objects, but part of a larger interconnected network, relating to natural systems.

Students assignments ranged from research to conceptual physical and digital modeling to resolved design strategies incorporating their specific program and site location, which was also part of the design process. Students were also encouraged to enter the eVolo 2012 Skyscraper Competition.

structure_skin conceptual design
One of the key design issues of vertical buildings is their structure and skin and how their other systems/components relate to these. After an initial introduction and research period into biomimetic themes, students created studies of potential structural systems and skin relationships. With regards to structure, in nature nearly all loads are carried by fiber composites. These are anisotropic (the property of the material depends on a direction, e.g. a grain in wood). Generally, they are good in tension and bad in compression (tension based systems per weight are usually more efficient than compression systems). Students looked at how nature’s tensile systems could be translated into buildings which generally today focus on compression systems.

structure_skin conceptual design, example of students work:
students: Cruz Crawford, Jongwoo Kim and Shaun Poon

final boards, examples of students work:
student: Jongwoo Kim
Jongwoo’s project utilized wind energy for the surrounding matrix in the city of Busan, South Korea.
student: Matt Propst
Matt’s project focused on improving the existing building stock in Phoenix, Arizona rather than creating a new building. His ‘parastic prosthesis’ became more dense when the existing context was environmentally weaker, becoming symbiotically related to the context.

student: Cruz Crawford
Cruz’s project focused on a physical manifestation of the forces of resources, transportation infrastructure and social interactions in a new hub in Kowloon, Hong Kong, China.
Design Studio: Advanced Topics
Arc 402, option 6-credit studio class, spring 2013
undergraduate fourth year student work

This studio semester was divided into two projects focusing on two different international competitions; Lyceum and ACADIA. Both competition calls related to biomimetic principles: emphasizing process and adaptability, beyond the conventional norms of most projects today.

**project 1 - lyceum student competition**

This particular year the call was; HERE AND NOW: A CALL TO ACTION. Instead of prescribing a particular program and site, they asked students to find an important local issue to create a proposal with contextual social relevance. “The submission should bear social, economic, environmental, and humanistic sensitivity and ambition, with the goal of empowering people in smart and sustainable ways without merely enforcing power structures.

We subscribe to the school of thought that design is never done, and particularly with socially oriented projects, we hope that your problem-finding and program framing will serve as a valuable design exercise for longer-term engagement.”

Entries were required to be in the form of an 11” x 17” booklet with a maximum of 8 pages, students were required to work individually.

“The Lyceum Fellowship was established in 1985 to advance the development of the next generation of talent by creating a vehicle for stimulating perceptive reasoning and inspiring creative thought in our field. Through a unique structure of design competition and prizewinning travel grants it seeks to establish a dialogue through design among selected schools of architecture. The design programs are developed by leading architects and judged by insightful jury members.”

**lyceum competition boards, example of student work:**

student: David Kim, won third place finish and $1500.00

David’s project focused on the soil contamination for a local copper mining community in Bisbee, Arizona. The design visualized this ‘invisible’ contamination with markers related to the pH balance in the soil. This was an attempt to educate and stimulate a recovered landscape for the neighboring community. Part of the design process was identifying the community participants to encourage a more bottom up, shared governance in these environmental responsibilities.
project 1, example of students work

Project 1: Aqua Lung

Aqua Lung: one of eleven blind peer-reviewed design posters accepted and published as part of the ACADIA Conference Proceedings (cover below), pages 395-6 and exhibited at the 2013 Conference in Canada. The project was motivated by New York City’s growing need for housing and the threat of a catastrophic storm surge. The bladder walls became a new typology of soft infrastructure for the City.

project 2 - acadia poster

The second and final project of the semester was based on the 2013 ACADIA Conference call. Students could work individually, or in teams of up to three, to develop their proposals for the poster submission category.

The call focused on Adaptive Architecture; “Adaptive Architecture will focus on the computational design of environmentally responsive, intelligent, interactive, and reconfigurable architecture. Exhibition submissions are invited across a range of topic areas that include distributed interactive systems, complex and generative systems, standards of passive and active design, and performance implications of sustainable architecture.”

Submittal requirements were two portrait boards at 24” x 36”. One board focusing more on renderings and details, whereas the other was more about process and techniques employed. This international competition was open to students, academics and professionals.
Design Studio: Advanced Topics, Urban Form  
Arc 402, option 6-credit studio class, spring 2011
undergraduate fourth year student work

This studio's intent was to study emerging directions for future cities: studying ways of form-finding verses form-making; using natural and built infrastructure, systems and flows to create new planning strategies, relationships and building typologies.

The studio consisted of 9 different teams/projects comprising of 13 students. Students worked individually or in teams of up to three people. Two additional students were added from the School of Landscape Architecture and Planning. We also had input from one of our Planning Professors, Ryan Perki. Teams were encouraged to enter the competition, The Arizona Challenge, hosted by Vernon D. Swaback’s Two World’s Community Foundation, Scottsdale, Arizona, with Ryan and I being team faculty advisors. The studio also incorporated a field trip to Los Angeles and San Francisco.

**assignment 1 - conceptual research**

Students were introduced to various urban and sustainable concepts and readings. The assignment was a strategy for them to disseminate this complex array of information into a presentation format.

**assignment 1, example of students work:**

students: Laura Huylebroeck, Autumn Ela and Jeremy Shough

Right:
Density studies; comparing Tucson to Manhattan, with tree canopies within a rainforest operation

Below:
Density on the site is concentrated within the energy cores to preserve the existing desert and allow development for parks, wetlands and agricultural fields. Through density studies, the projected target density for the site is 10,000/1 sq mi and 40,000/ 4 sq mi.

**assignment 2 - digital methodologies**

Students had 2 weeks to research various digital methodologies and platforms that could be useful for their design process

**assignment 2, example of students work:**

students: Laura Huylebroeck, Autumn Ela and Jeremy Shough

The student team researched the concept of an adaptable urban scale canopy membrane; with adaptability to water, solar collectors and embedded wind turbines, using parametric modeler, grasshopper, connected live to environmental plug-in, ecotect.

**assignment 3 - competition design**

**assignment 3, example of student work:**

students: Laura Huylebroeck, Autumn Ela and Jeremy Shough

Various drawings and physical model showing site design strategies based on existing drainage paths.
awards ceremony, september 2011
at the ASU Stardust Center/PURL Ballroom, Phoenix, AZ
The top 3 student teams made public presentations to the jury, local community, faculty advisors, politicians, scholars, friends and family.

examples of final competition boards:

"HARVEST (arizona)" Desert Bronze Award, 3rd Place, $1500 prize
students: Dana Decuzzi and Aaron Liggett

"ARID SYSTEMICS" Honorable Mention
students: Cruz Crawford and Sheehan Wachter

photos by Mike Benedetto, courtesy of the Two World’s Community Foundation
Design Studio: Advanced Topics, Urban Form
Arc 402, option 6-credit studio class, spring 2012
undergraduate fourth year student work

For the second iteration of the urban form studio specific emphasis was placed on the collaborative and synergistic outcomes that may be realized through integrating and focusing the efforts of architecture, landscape architecture, and planning on the personal relatedness and relationships of community, i.e. bringing social and human aspects more into the forefront. This program, co-sponsored by the College of Architecture, Planning and Landscape Architecture (CAPLA) at the University of Arizona and The Two World’s Community Foundation was designed to explore the insights of design-based thinking on an urban scale and was a chance to build on the previous successful International Arizona Challenge 1.0 with two winners in the top 5. The Arizona Challenge 2.0 was also an opportunity to make the previous trans-disciplinary collaboration more robust, the architecture studio class was co-convener with Assistant Professor Dr. Ryan Pivik’s graduate planning GIS (geographic information systems) seminar once a week to facilitate this. A road-field trip to San Francisco and Los Angeles via the coast was also incorporated into the semester.

assignment 1 - conceptual research
The first 2 assignments were completed without trans-disciplinary team work; mainly as an effort to bring students up to speed with the latest issues and respective digital technologies. The first assignment, like in the previous year, emphasized conceptual understanding of the complex issues. Here the emphasis was on documenting the inter-relationships of the multiple issues.

assignment 1, example of student work:
student: Marcela Gracia, example sheets of final dissemination

assignment 2 - digital research + methodologies

assignment 2, examples of student work:
students: David Gonzalez and Kyle Szostek
their project researched how social networking technologies could inform future architecture

students: Elizabeth Lorenz + Alex Zee
their research involved digital parametric carrying capacities, plus methods for aggregating self-organized form
assignment 3: site selection process

Student teams were created from the 2 classes and from this point onwards all work was collaborative in nature. Student teams had the freedom to select a site of whatever size and configuration, in and around Tucson, that they felt provided their team with the best opportunity to illustrate their ideas. The sole limitation placed on the selection was that the site was large enough to allow for the exploration of some form of “custom community.” In selecting the site, the exploration of innovative site selection methods was strongly encouraged; the process, rationale and ultimate site selection was evaluated as the foundation of their proposals.

assignment 1, example of student work:

students: Mitch Edwards, Elizabeth Lorenz + Alex Zee
Site selection process incorporating GIS methodologies:

winning competition boards:

Gold Award ($2500.00) - 20 Minute-City
students: Meredith Abrams, Nada Asadullah + Anh Luc
The team integrated personal mobility, amenities, and day-to-day activities within their community

Silver Award ($1500.00) - Recipro[city]
students: Daniel Aros + Brian Underwood
The project provided a solution-based alternative to communities by focusing on community engagement, public and private ownership, and flexibility of design. It created an alternative to an existing auto mall in Tucson.

Bronze Award ($750.00) - Desert Sponge
students: Mitch Edwards, Elizabeth Lorenz + Alex Zee
The team featured inventive techniques by which the community can be cultivated with water, the desert’s most precious resource.
Design Studio: Advanced Topics, Urban Form
Arc 451a, option 6-credit studio class, spring 2014
undergraduate fourth year student work

For the third iteration of the urban form studio work was developed on strategies from earlier studios, with an added focus on social inequality issues and adaptability. This related to form, future climate change and the need for urban/building scale feedback loops. The emphasis was not about destroying the city or working in utopian isolation, but about a response to an existing fabric starting with research into the existing condition, analyzing the pros and cons of formal (top down) versus informal planning (bottom-up).

Ultimately one of the studio goals was to enter the poster call for ACADIA 2014. ACADIA is about computer-aided design. Any successful entry needed to be sophisticated in this area. This determined the final format of the projects: two 24” x 36” portrait boards. The emphasis of digital tools varied from project to project, but were encouraged to relate to systems and cycles in a way that shows some forward, ecological and critical thinking. This year the conference theme was an instigation of work that looks at re-defining the term “Agency” through the lens of computational design strategies such as simulation, fabrication and novel integrations from science and the media arts. Students were able to work individually or in teams of up to three students.

Assignment 1 - Conceptual Research
The first assignment like in the previous years emphasized conceptual understanding of the multiple issues with an emphasis on documenting the inter-relationships and complexities. The additional emphasis on Mexico City highlighted opportunities for mega-city studies, plus social equity, the majority of the city comprising of informal settlements.

Assignment 1, example of student work:
Student: Lisa Martinez, sheets of final dissemination

Assignment 2 - Digital Research + Methodologies
Students researched various digital techniques and methodologies for form and mapping generation/site selection.

Assignment 2, examples of student work:
Student: Cesar Rodriguez, example sheets of final dissemination, showing digital mapping techniques/site selection of various social and environmental criteria. He also researched the history of growth of the City.

Student: Dulce Arambula, example sheets of digital process, including processing software screenshots at the bottom. Dulce focused on the use of genetic algorithms as a way of developing self-organized form.
examples of final boards:

student: Cesar Rodriguez

Cesar’s project was focused in Neza, an informal area just outside the Distrito Federal boundary. Unlike other informal areas Neza was formally planned, resulting in a complex mix of formal blocks and loose, uncontrolled development. The primary goal of the project was to improve the environmental infrastructure and return green space which had been taken over, including the individual users in the process.

photos of field trip to Mexico City, Mexico:

L to R: Zocalo, Universidad La Salle, Palacio Nacional, Cineleca Nacional, Barragan House, Central de Abasto, Museo Soumaya, Frida Kahlo and Diego Rivera Studios, Jose Vasconceles Library, Museo Jumex. Also visited Teotihuacan, Xochimilco, UNAM, various architects offices including TEN, Alberto Kalach and FR-EE, Fernando Abiottt Saro (head of new Agencia de Gestion Urbana) and various site visits.

Photo credits: Susannah Dickinson, Casey Kell, Joe Miranda + Universidad La Salle
This team created parametric site relationships to ultimately select their site in Iztapalapa. This site was selected as it was a primary, tumultuous example of Mexico City’s defined problems. The project posited a multi-scalar approach to systematic growth and localized sustainability. Their project sought to relocate production back into communities with improved transportation infrastructure, waste management, recycling and pollution mitigation.
Independent Study: centipede bench
Spring 2011, students: Paul Frederickson (5th year undergraduate) and Tyler Jorgenson (4th year undergraduate)

Independent Study exploring the ideas of geometry, material and adaptation. The work resulted in the fabrication of a modular bench unit, with various finishes for indoor and/or outdoor use (plywood and mesquite). The digitally fabricated steel was given a clear powder-coated finish, with various colored 'feet' options. These benches were purchased by the School of Architecture and various private clients.

Independent Study: bento shell
Spring 2012, students: Cruz Crawford (5th year undergraduate) and David Kim (3rd year undergraduate)

This speculative proposal seeks to “re-sensualize architecture [computational fabrication] through a strengthened sense of materiality and hapticity, texture and weight, density of space and materialized light.” (Juhani Pallasmaa, The Eyes of the Skin).

'Bento Shell' proposes a morphogenic design strategy where form, structure and material act upon each other. Form-finding is a combination of localized forces, curvature analysis and material properties at a micro and macro scale: creating a synergy between the virtual and the real, design and fabrication. Redefining the relationship between figure and ground, interior to exterior, the system is inherently expandable with the possibility of incremental growth depending on the surrounding forces and context. Human experience changes as the harder, closed, natural wood veneer unfolds, opens and twists, exposing the softer, tense, fabric under-belly adding transparencies within inner horizons. This attempts to provide a "dislocation of the subject from the effective space; an idea of presentness." (Peter Eisenman, Visions' Unfolding: Architecture in the Age of Electronic Media).

Modules are a combination of layered veneer and tensioned fabric. Grain direction and void size relate directly to the curvature of the component.

Components combine in various possibilities; in this example going from flat, smaller modules on the ground to various dimensions and curvature depending on the overall form selected. Connecting compression rods further relate to the curvature normal.
Project description
William Mitchell, in ‘E-topia’ wrote that because of the digital revolution of ‘bits’ traditional urban models were no longer valid. He defined the new urban condition as “lean, green cities that work smarter, not harder. Their basic design principles may be boiled down to five points . . . 1. Dematerialization, 2. Demobilization, 3. Mass customization, 4. Intelligent operation and 5. Soft transformation.” (William Mitchell, E-topia: urban life Jim – but not as we know it, 2000)

This project shows the work of an undergraduate student design/research proposal from the University of Arizona for a desert city set in the year 2087 that would incorporate Mitchell’s design criteria. The project, ‘Isomorphic City’, developed a truly customizable and ever-adapting built environment which was shaped by environmental issues, virtual reality and social media. City dwellers would have direct control over the programmatic functions of their city while at the same time the environment would set parameters limiting the excessive and negligent use of resources. This allowed the city and its inhabitants to become symbiotic within the natural ecosystem of the desert. The vision predicted that digital designers, programmers, developers, architects, and environmental experts would constitute the main demographical work force required to maintain the city.

Part of the challenge, which the project shows, was to design digital methodologies that could simulate this future scenario in as live a way as possible, incorporating real-time, live data into the equation. Form would be the result of inputted parameters verses the making of form in an ‘object-like’ fashion. Going from a rule based way of simulating the complex urban condition to a more human agent-based approach based on collective intelligence.

Independent Study: isomorphic city
Fall 2012, students: David Gonzalez and Kyle Szostek (5th year undergraduates)

The applicant saw architectural merit in one of the previous option studio projects, so she encouraged the two co-authors to work with her on the development of the project, computationally and design-wise in the hope of obtaining a level of publication quality.

The following independent study resulted in one national blind peer-reviewed full paper, an international peer-reviewed extended abstract and project and a national peer-reviewed poster selection.

Independent Study: structural form finding co-taught with Wilson Peterson
Spring 2014, student: David Kim (5th year undergraduate)

This Independent studies goal was to develop a methodology related to structural form finding and digital techniques for creating architectural space with a view on sustainable practices. Structural forms were derived using lightweight form to cast materials for compression testing. Geometries found by this means could be verified and further developed using digital methods including scripting with physics-based parametric models, and model-based structural analysis software to study stress distribution.