

Professor Anthony Viscardi

Paper: Bio-Structural Analogies: Brazilian Design Workshop



Topic: Architecture

Authors:

Name1

Professor Anthony Viscardi

The Department of Art, Architecture and Design
Lehigh University

www.lehigh.edu/~av03

www.viscardia.zzl.org

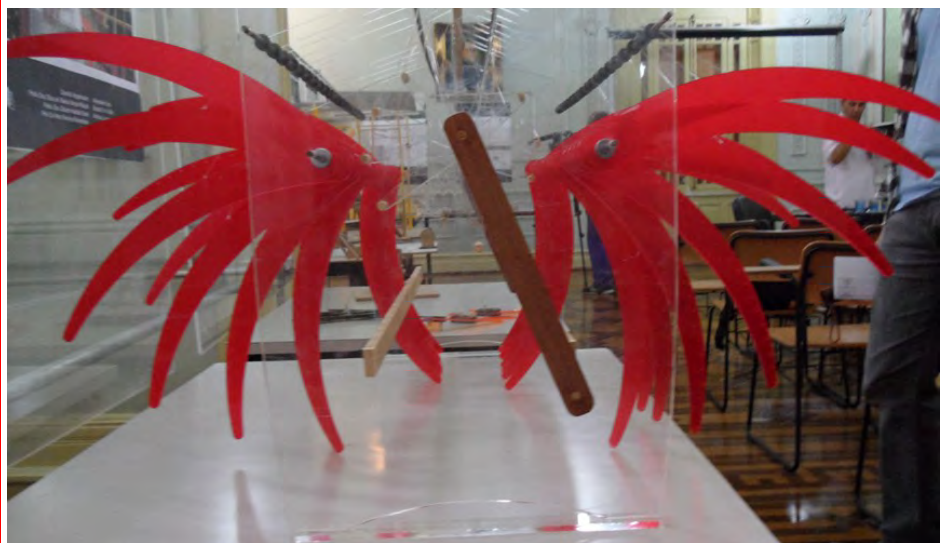
www.generativeart.com

Abstract:

This paper is an account of the experiences and accomplishments of a 7-day Intensive Design Workshop I conducted in collaboration with FAU (Faculty of Architecture and Urbanism) at the University of Sao Paulo, Brazil during their summer session in February 2012. Earlier in May of 2011, I was invited to conduct a series of lectures at FAUUSP after meeting several of their professors at an annual Generative Arts Conference in Milano, Italy, in December of 2010. The GA conference has been a very important facility to share pedagogies and to exchange ideas and faculty. I present this paper as a testament to this conference's virtues as a conduit for creative collaboration in the generative arts.

In collaboration with an organizing committee composed of Profa. Dra. Clíce de Toledo Sanjar Mazzilli, Profa. Dra. Cibele Haddad Taralli, and Prof. Dr. Artur Simões Rozestraten, I drafted an outline and schedule to present and conduct this experimental design workshop during the month of February, 2012. Together we engaged the students in an invigorating design charette.

The workshop focused on bio-structural analogies and was fashioned after my semester long studio pedagogy developed in the Department of Art, Architecture and Design at Lehigh University over the past ten years. The final results and by-products of this immersive experience were very successful and on many levels beyond our wildest expectations.



Contact:

av03@lehigh.edu

Keywords:

Bio-Structural International Design Workshop Brazil

BIO-STRUCTURAL ANALOGIES: ARMS, WINGS AND MECHANICAL THINGS

By Professor Anthony Viscardi
Lehigh University, Bethlehem, Pennsylvania, USA
av03@lehigh.edu

DESIGN WORKSHOP February 7- 16, 2012
FAUUSP: Faculty of Architecture and Urbanism,
University of Sao Paulo, Brazil

Abstract

This paper is an account of the experiences and accomplishments of a 7-day intensive design workshop I conducted in collaboration with FAU (Faculty of Architecture and Urbanism) at the University of Sao Paulo, Brazil during their summer session in February 2012. Earlier in May of 2011, I was invited to conduct a series of lectures at FAUUSP after meeting several of their professors at an annual Generative Arts Conference in Milano, Italy, in December of 2010. At the GA Conference, I presented a paper on my design pedagogy that generated interest and prompted the invitation to speak at FAUUSP in the near future. During the speaking engagement at FAU, I discussed, with a small group of FAU professors, the possibility of returning to teach an intensive design workshop during the school's summer session. In collaboration with an organizing committee composed of Profa. Dra. Clíce de Toledo Sanjar Mazzilli, Profa. Dra. Cibele Haddad Taralli, and Prof. Dr. Artur Simões Rozestraten, I drafted an outline and schedule to present and conduct this experimental design workshop during the month of February, 2012. The workshop will focus on bio-structural analogies and will be fashioned after my semester long studio pedagogy developed in the Department of Art, Architecture and Design at Lehigh University over the past ten years. The results and by-products of this immersive experience turned out to be very successful and on many levels beyond our wildest expectations.

Bio-Structural;,. Analogy;,. Drawing;,.

DESIGN WORKSHOP PEDAGOGY

The studio would utilize the skills of drawing both analogically and digitally to initiate their associative thinking process. Later, through model making both by hand and using the laser cutter, the students would form structural prototypes by studying systems outside of the normative building practices, but derived from nature, in order to discover alternate forms of architectonic propositions. The students finished the workshop by mostly working in small groups. This proved to be very successful in that it forced collaborative decision making and group authorship. Several of the workshop students have been encouraged to utilize their findings as a point of departure in their design studio during the following semester. The faculty at the University of Sao Paulo embraced the design workshop and saw multiple possibilities for augmenting future design curriculum in their interdisciplinary programs. Not only did this workshop succeed in what the students produced but it also acted as a platform for future discussions about design research and architectural curriculum in general.



Students doing initial drawing exercises

One of the challenges of design instruction is to establish a fertile environment for discovery and imagination, whilst grounding design work within architectural constraints. The beginning student especially has difficulty juggling the specific programmatic requirements of a studio brief, and the open-ended-ness of the design process itself. To compound this dilemma, design studios often assume the lexicon of “problem-solving”; the final design is commonly referred to as a “solution” or “answer”. When the design process is goal-oriented in the early stages, the possibilities for open exploration and imagination are curtailed. An experimental design studio that I initially conducted at Lehigh University’s Department of Art and Architecture sought to remedy this dilemma.

In order to establish the studio as a setting for wonder, research, and invention, this experimental studio/workshop emphasized the process of design inquiry. A select group of students from the undergraduate and graduate levels of Design at FAU undertook a series of intensive exercises (which were cumulative in effect) based on a series of analogical studies. Analogy was an effective device for creative invention, since parallel readings were implicit at many levels, from surface meaning to operative functioning. Analogical exploration also allowed the students to assimilate complex forms and processes from realms outside of the architectural discipline. The

students were thus enabled to discover architectural form and use in a manner unencumbered by preconception and conventional program.

Using analogy in the form of design assimilation, one is positioned to rely on his or her creative ability to associate and fabricate objects that engage materials into relationships that convey parallel meanings. These constructions can, in turn, establish formal orders that become the basis for an architectural grammar of details. Their meaning is gained through their ability to conform or transform to the context in which they are placed. These construction details can also be employed as a point of departure in the development of a design process. Through an analogical study of the joints in the body, the invention of a joint detail can form the basis of an architectural vocabulary that can lead to several forms of design development.



First design review of three analogical collages

Exercise One: Collage of Arms, Wings...

The analogue studio, therefore limited itself to the investigation of the architectural part, or detail, specifically, joints and connections. These exercises would eventually lead to specific propositions, such as, cantilevers, corbels, arches, trusses, hinges, and pivot joints. These devices were not a priori goals, but were discovered through the form-making process itself. To begin, the students observed and compared the arm of the human body and the wing of birds, bats, or insects in terms of dynamic forces accommodated by the muscles, tendons and joints of these two body forms. Several students also researched other creatures for analogical relationships such as worms, jellyfish and fleas.

... and Mechanical Things

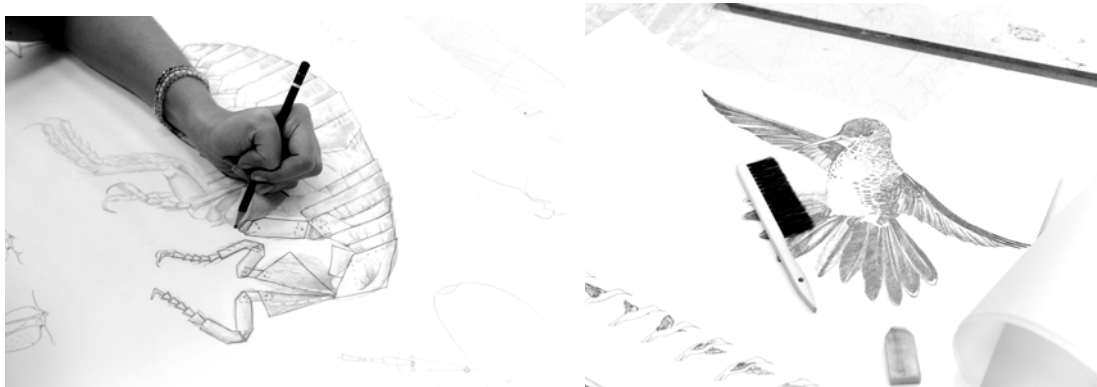
The students then proceeded to develop a third collage of mechanical artifacts that had an affinity to the previous studies. Simple devices (such as lamp arms, car jacks, umbrellas, drawing instruments) were sought. As in the earlier collages, mechanical items were sampled from a combination of photographs, objects, drawings and words. The students concurrently observed the drawings of Leonardo da Vinci, in

particular, those that simultaneously convey the analogous workings of mechanical, anatomical and architectural devices. From these drawings the students could infer the interchangeability of parts that were human, animal and mechanical — i.e. whereby one part could be the “prosthetic” of the other.

Exercise two:

Drawing Constructions / Constructing Drawings

In this process of investigation and discovery, drawing acts as a means of construction, of ideas, of images, of analysis and of association. The drawings will be viewed as scaffolding; a temporary architecture used to help concretize an idea that leaves its trace in your final construction, allowing 2-D and 3-D to collude in the process of design.



Students drawing their bio-structural analogies

observation/analysis interpretation/translation transformation/fabrication

The next phase of this series of observations begins with a detailed enlargement of a particular wing/creature scaled up at least double in scale. This means of magnification and rendering intensifies one's focus to prevent shifting attention to quickly assuring that observation will not be short-circuited into translation as mere imitation. It is more important to continue the seeing process by forcing hand/eye coordination to slow down permitting a closer look. It will allow the mind to wander generating creative associations to occur while rendering tonal gradations. This releases the daydream. It is in that zone that tangential co-incidents collude to form new interpolations of hand/mind and mind/hand thinking.

The exercise will consist of three layers: Each layer will look at a different aspect of the wing: a realistic look at the nature of its parts, a geometric abstraction and a mechanical extrapolation. Each sheet conveys a distinct view of your specimen. All sheets are pencil on Mylar except the first sheet, which is on watercolor paper stock.

observation/analysis.....as is: We began looking very close so the eye could attain a tactile sense—inhabiting the detail. After reviewing the visual collages, each student clarified a particular perspective that would direct this next phase. Students now choose an appropriate image of their wing/creature to further his/her research. Draw the wing at least twice the size of the photo to be placed in the middle of a 24x 32 piece of watercolor paper [hot press] leaving at least a 6” border on all sides for even closer studies. This first sheet is to be purely observation of the actual wing analyzing its parts through realistic close up rendering.

interpretation/translation.....as ab: The next sheet is on Mylar and drawn in pencil to interpret the parts of the wing/creature in a more geometric construction. This technique requires a translation of the parts into a geometric vocabulary viewed as an overlay upon the preliminary realistic drawing. This **abstraction** will allow you to see the workings as interpreted through geometry.

transformation/fabrication.....as ob: This final sheet of Mylar will transform the visual information into a construction analog to direct the fabrication of a series of tectonic devices...workable, buildable **objects**. This drawing would work in conjunction to each student’s sketchbook where they would work out construction details and performance criteria.

Exercise Three: SIMULATION VS. ANALOGY



Students and faculty talking about their models

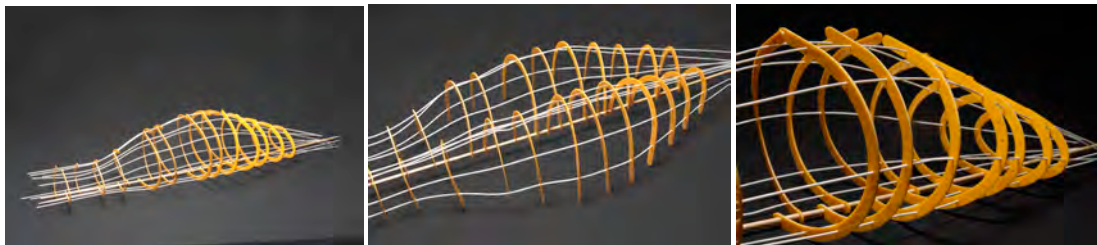
mechanical simulacrum: From the studies in Exercise Two, each student created a model, or mechanical simulacrum, that could demonstrate the dynamic actions from their previous wing analysis. These models were crafted from basswood using mechanical hardware for joints and built at a large scale (usually 1:1). Using the form language derived from the geometrical abstraction (the second layer in Exercise Two), these constructions translated the actions of the wing in its entirety. Resemblance of the model to the mechanical, (or operative) appearance of the entire wing was desirable in this model.

mechanical analogue: The students constructed the second model, or device, as a mechanical analogue to a specific part or detail of the wing analysis. It gained its potency from the nature and fit of its parts. This model did not attempt to resemble but to demonstrate metonymically the action of a particular condition. The parts could be separated from their context or viewed as a series of parts disconnected from the whole. Resemblance of the model to the original was not desirable for this model. The models were meticulously crafted, whereby each and every joint and connection acquired a distinct character. The students made additional “working drawings” in their sketchbooks, while constructing the models, whereby drawings and models informed each other in an interactive dialogue. Each model obtained an intrinsic value in relation to its function of movement and support and also acted as an initiator to new refinements and innovations.

Creative Collaboration

At this point of the workshop, after each student presented their simulation and analogue models, small working groups were established with models that demonstrated similar concepts, ideas and constructions. The teams were to spend the final three days to formulate new hybrid designs that demonstrated the strengths of their individual counterparts into one resolved new analogical construction. The remainder of the workshop would take place in LAME, the technical workshop laboratory at FAU as an intense and immersive design/build environment.

Natural Growth as a Generative Analog



Caterpillar analogy final models

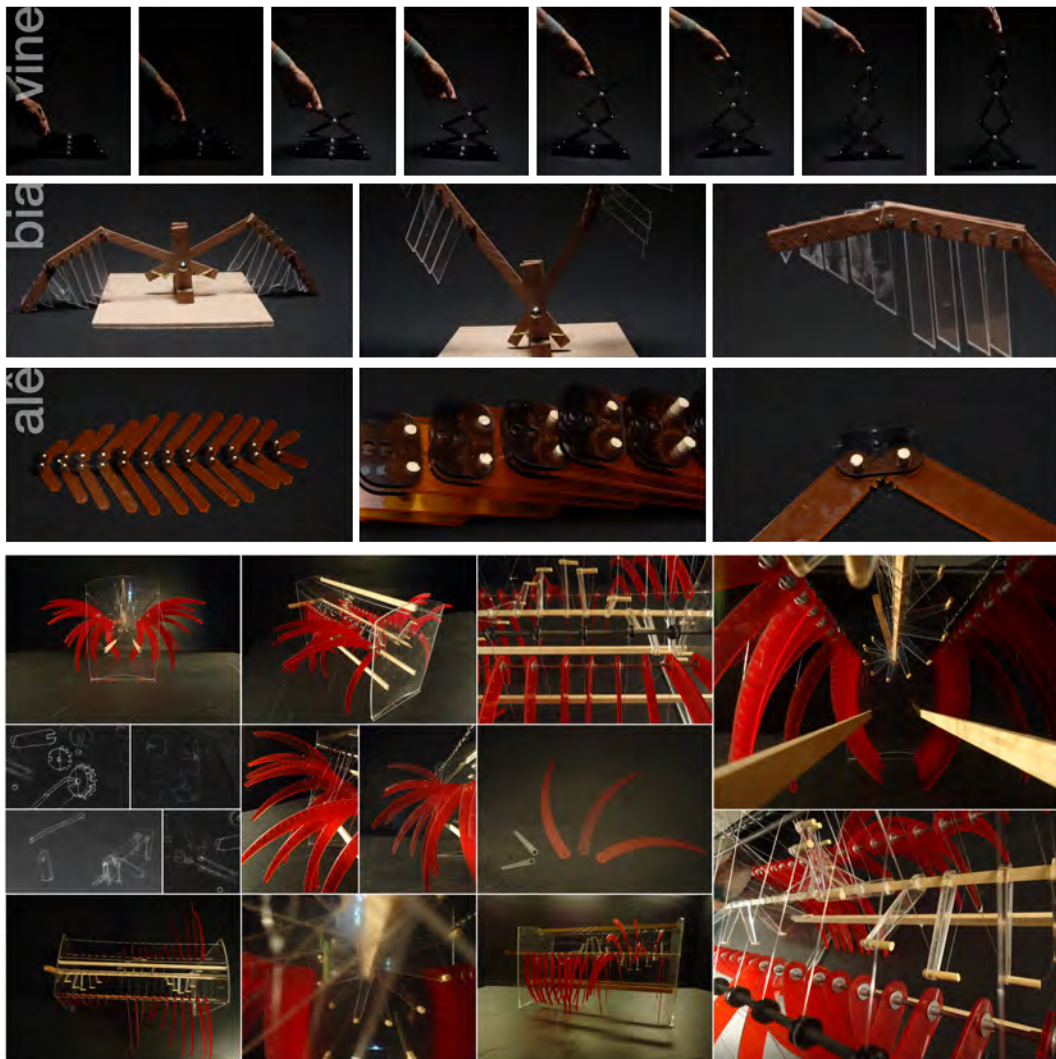

For this portion of the studio, in a reversal of ordinary studio practices, the students assumed the responsibility for determining the meaning and functions of their architectural constructs. By looking at function as a response to the manufactured artifact (rather than as the initiator of its design) the students evaluated the intrinsic properties of their invented form. Could the devices return to architectural situations that involve the action of the human arm, such as a door swing? Could their devices become roofs, walls, or both simultaneously? Could the study of natural growth patterns provide an analogous process to design development? In all things natural, growth generates form. The students were now to reconstruct a new body propagated through the multiplication of a single element of the arm or wing into an

organization of parts. These parts would establish systems and ultimately networks of performative results.



WORKSHOP Prof. Anthony Viscardy
Lehigh University, EUA

Bio-Structural Analogies: Analogias Bio-Estruturais:
Arms, Wings and Mechanical Things Braços, Asas e
Artefatos Mecânicos

Comitê Organizador:
 Prof. Dra. Clídice Toledo Sanjar Mazzilli
 Prof. Dra. Cibele Haddad Taralli
 Prof. Dr. Artur Simões Rozestraten

Alexandre Lins
 Beatriz F. A. Brito
 Vinicius Langer Greter

Student Group Final Poster Presentation