BUBBLE UP:
ALTERNATIVE APPROACHES TO RESEARCH IN THE ACADEMIC ARCHITECTURE STUDIO

Gregory Marinic

Abstract
Increased connectivity among the design disciplines has radically transformed the nature of building today. Architectural education must accordingly adapt to the emerging needs of our changing built environment by providing vital, flexible, and open learning environments. Pedagogies in the academy have typically been rooted in practices that are both reluctant to change and slow to address transformative forces in an honest and open manner. Regrettably, the resilience of such top-down methods continues to bias the lens of learning toward natural performers and the notion of singular genius. Authentic attempts to react to new demands and to introduce change are all too often met with both strong resistance and profound contempt by conservative critics. Mainline architectural academia continues to project a deep ambivalence to new methodologies, alternative approaches to context, broadened conceptual practices, and advanced visualization techniques. Yet such means provide a responsive and resilient structure to re-frame content, expedite delivery, and update pedagogical objectives for the next generation.

Keywords
Architectural education, pedagogy, digital fabrication.
Introduction

Increased connectivity among the design disciplines has radically transformed the nature of building today. Accordingly, architectural education must adapt by providing vital, flexible, and open learning environments that address the emerging needs of our changing built environment. Classic architectural education has typically been rooted in practices that are both reluctant to change and slow to address transformative forces in an honest and open manner. Such top-down methodologies frequently bias the lens of learning toward natural performers and the notion of singular genius. Authentic attempts to react to new demands and to introduce change are all too often met with both strong resistance and profound contempt by conservative critics. Mainline architectural academia continues to project a deep ambivalence to new methodologies, alternative approaches to context, broadened conceptual practices, and advanced visualization techniques. Yet, such methods provide a responsive and resilient framework to re-frame content, expedite delivery, and update pedagogical objectives for the next generation.

If architecture is a living organism of historical reference, trans-disciplinary theory, social consequence, aesthetic preference, and changing technology then architectural education should flexibly interface with, adjust to, or address reigning paradigms. Today, the design process is an increasingly complex undertaking, offering vast procedural and methodological potential. Enlightened architectural pedagogies should strive to create an alternative world that is better than the one we currently inhabit.

The Beaux-Arts, The Bauhaus, and Emergence

Classic Beaux-Arts architectural education embedded a practice of justifying aesthetic bias through self-determined procedures and prescribed evaluation criteria. This philosophy promoted design output that was at once formulaic and invariable.

The inherent bias of Beaux-Arts methodologies, based on formalism and preconception, established a culturally biased framework that further justified conceptual moves in plan, section, and three dimensions. Echoes of this conventional academic legacy remain a discernable undercurrent within undergraduate architectural education in North America. And while this top-down approach imposes significant limitations, it offers the opportunity to identify and engage conventional but time-tested methods of urban analysis, building organization, and form generation. Thus, its effectiveness as a basic methodology is undeniable. The recent emergence of computational tools and approaches, however, has begun to significantly challenge the contemporary relevance of an architectural educational system based on this classic formulaic model.

As a reaction to conventional practices, the German Bauhaus movement proposed a ‘Modemist’ alternative. Representing a dramatic shift away from French methods toward those of the Modem Movement, the Bauhaus asserted that design was not simply a theoretical or material investigation, but rather the convergence of modern technology and mass production. While the Beaux-Arts School refused to accept this ideology, the Bauhaus embraced interdisciplinary approaches and...
production efficiencies. So, perhaps, the recent interest in “complexity” in architecture is not new after all, but rather a re-acknowledgement of the multi-faceted experience of architecture. Shifting social, psychological, political, and economic forces operating against the built environment have become increasingly apparent in the age of globalization. More than any other human artifact, architecture embodies the most fundamental values and cultural preoccupations of a society. Ours has been significantly redefined by the internet, and thus its impact on the built environment must be considered in theoretical dialogue. This architectural age has been shaped by its desire to more critically connect with forces well beyond the act of building in a vacuum. As an alternative, architecture based on bottom-up, research-intensive inquiry offers the power to broadcast a powerful and lasting message that speaks to our age.

Emergence: The Rationale

In academic environments, frameworks that promote efficient, integrated, and open design environments promote the spirit of limitless exploration. Offering continual opportunities to develop a personal voice, defined by a rigorous conceptual process, is of particular significance in this realm. The studio critic should foster a methodology where alternatives are tested and critiqued, composed of a matrix of variables that address contextual, structural, programmatic, functional, technological, and metaphorical potentialities. Accordingly, the emergence of building form should not reflect the personal proclivities of the critic, or their prescribed goals and needs, but rather offer avenues for students to interpret the landscape, its user, flows, behaviors, and the inherent seen and unseen systems of the project’s context. This way of working—an emergent approach—allows built form to reflect the care and complexity of a thoughtful design process. Design is then a product of inquiry and may be supported by charted and mapped linkages in the investigation.

From Top-Down to Bottom-Up

Our built environment is seldom the product of a singular artistic approach. Accordingly, it should be given the opportunity to emerge from a thoughtful process where programmatic goals address relevant physical, cultural, and technological conditions particular to the time. And while the design process is inherently guided by logic, it is profoundly dependent on conceptual creativity. Embracing research-intensive and emergent pedagogical approaches in design studio provides an atmosphere where logic and open-ended investigations lead to broader cross-disciplinary expertise, and thus increased project complexity. This bottom-up approach, if employed effectively, allows for a greater synthesis between formal proposals and conceptual underpinnings. The process tends to enable a higher level of design performance from students with less articulated skill sets. In consequence, the total output of a studio led by the bottom-up philosophy tends to result in a greater percentage of successful works than those forums guided by traditional top-down methodologies.

The rise of the Internet, and the resulting increase in access to massive amounts of data, has transformed the ability to undertake research-intensive studio work requiring technical and geographic data that is at once
accurate and time-sensitive. Additionally, the development of new digital visualization and fabrication techniques rationalizes the consideration of bottom-up emergence as an alternative paradigm to previous ideologies. Unlike conventional architectural processes, self-organizing opportunities rely less on the singular genius of an individual designer and more on the ability to collaboratively research, disseminate, transform, and deploy contextually coherent proposals. Methods that engage context in a broader sense can address sustainably grounded approaches that study change-over-time and nature-based drivers in an intelligent and provocative manner. A carefully considered bottom-up approach embeds the designer into an alternative understanding and broader definition of urban patterns, social concerns, behavioral flows, and material potentialities. Instead of subtracting the self-motivated rationale for concept, this methodology re-engages the designer into a previously unconsidered investigative journey. Applying this approach to ecological cycles can provide a complex network of new potentialities for sustainable building beyond conventional means.

**Balance and Choice**

Today, foundation studios that introduce bottom-up, self-organizing processes alongside more traditional top-down methodologies allow a certain balance and choice to emerge early in the minds of young architects. For instance, the study of systems in nature can allow understanding of modulated environments, emergent morphologies, and material behaviors related to environmental performance to develop. These methods have traditionally been tied to culturally biased exemplars such as the Golden Section or Le Corbusier’s Modular. Typically referred to as bionics or biomimicry, a morpho-ecological design approach, when combined with conventional theories in architectural studio, offers a high level of design competence and success for students due to its focus on identifying performance—performance that may be tested with various methods and means. By considering higher-order performance capacities based on multifunctional environmental systems, students are introduced to an endless cache of data for design inspiration and process intervention. Likewise, personal notions of order, scale, proportion, and form are influenced by intrinsic performative qualities within our world that offer exciting formal experiments and opportunities for transformation at various scales. In this case, the bottom-up approach offers a dazzling array of connectivity through its emphasis on research and experimentation. Yet this notion of evolution, adaptation, and open-endedness does not naively assume that a “projective” practice—one that reflects the world as it exists back unto itself, is simply a means to an end. Rather, the architectural process becomes a journey of discovery that pushes conceptual limits and self-given goals, while engaging pragmatic site, program, sustainable, and cultural influences as overlays that provide contextual appropriateness, site specificity, and delight. Emergent, or bottom-up, approaches embed the student in complimentary knowledge bases. As future architects, such forms of expertise may lead to greater sensitivity of forces beyond the normative emphasis on formal, structural, and basic contextual concerns.
Bubbling Up and Breaking Out
Parallel to this shift toward bottom-up methodologies, advanced computational techniques have enabled an organic design to reemerge through our ability to mathematically describe complex forms with complex geometries. Such computational techniques offer a level of academic experimentation that is certainly natural with the advent of new technologies. While formally exciting in the studio environment, full-scale digital fabrication of these experimental environments in practice has not kept pace with architecture in academia. In essence, bottom-up approaches have enabled the academic horse to pull the practice wagon—allowing academia to reassume its role as the driving force for innovative thought in the art and technology of building.

The current interest in radical form should not translate into antipathy toward the realities of building. Rather, their complexity should inspire greater commitment to problem-solving in both high-tech and low-tech ways. Naturally, the studio environment offers students a forum for testing the most interesting architectural techniques of today—a place to mediate between the ideal geometries of tomorrow and their potential in the real world. Meeting the challenge of practicality bases the conceptual academic environment within the context of problem solving. These efforts offer the potential to redirect the development and refinement of our material culture so that performance-based, truly sustainable architecture can ultimately be realized in the future. Formal computational exploration paired with bottom-up research methods offers a certain balance and control against the potential aesthetic frivolity.

Emergent Research and the 21st Century City
The cities and buildings that we inhabit represent temporal manifestations of mass, space, time, and memory. The development of 21st century urban space and architecture can be re-conceptualized through an emergent lens. How do such environments grow, transition, and transform? How does the integration of digital conceptualization tools with physical matter produce increasingly malleable architectural organisms, flexible spaces, and transformative assemblies?

With the advent of digital methodologies, cities, buildings, and interior space may be conceived more fluidly in terms of information. This shift from analog means to digital systems of conceptual design and material production enables a more profound interaction between designer and audience. A need to address such issues in design education framed our intent for a research-intensive undergraduate design-build studio examining the Bushwick neighborhood of North Brooklyn. The studio sought to postulate how built form can blur the boundary between mapping and making of cities, buildings, spaces, and places.

Emergent Exemplar: The Bushwick Project
The undergraduate architectural design studio environment offers untapped potential for advancing unconventional approaches to design research and teaching. Framed through the lens of an alternative pedagogy, our semester-long collaborative studio investigated urban emergence in the conceptualization of a design-build interior environment. This effort
attempted to architectonically synthesize notions of place and culture and identified the neighborhood context of post-industrial Bushwick, Brooklyn as a laboratory of urban, social, and demographic data. The studio approached this endeavor from a bottom-up point of departure, casting its lens on the current relationship between information and production asking: How does an increasingly enhanced complicity between architect and audience inform the design of urban spaces, architecture, interiors, and objects? The studio philosophy attempted to re-propose how architectural space could be reconceived through alternative approaches to examining context. By working through allied disciplines to explore architectonic potentialities, the studio sought to expose how interior environments can transition, transform, and grow from contextual inputs. It worked toward fusing digital conceptualization tools with physical matter toward the production of a malleable architectural organism—a construct that could modulate interior space through its transformative assembly.

**Blurring Boundaries**

The studio attempted to blur the boundaries between the design process and the act of building itself. By identifying anthropomorphic relationships, morphologies, and change within a Brooklyn neighborhood undergoing significant gentrification, students sampled the context for site-specific data at various scales. These opportunities were considered through the study of various material conditions and connective operations particular to the neighborhood, then rapidly tested through mapping and digital fabrication processes. A series of focused charrettes keyed into emergence at various points of contact.

A pedagogical goal of reconnecting students of architecture with informal approaches to building within significant constraints was central to the studio. Students were introduced to the complexities and compromises inherent in contemporary architectural practice, whereby they designed, managed, procured, and ultimately deployed built form. Likewise, the project compelled students to cultivate a personal approach to imagining space, while simultaneously working toward a collaborative solution. Perhaps most importantly, the project allowed students to reconsider various traditional processes of making from generative-to-full-scale.

In practice, the design process is typically based on the formation of a project team, where various constituencies engage toward the ultimate delivery of a master plan, a building, or an interior space. In this project, this team was effectively the studio critics, the students, the hypothetical abstract “client”—an alternative gallery in Bushwick; and a series of visiting critics, advisory groups, and jury members that helped guide the design process. We attempted to express an openness to explaining the practical realities of the process of making in architecture and to generate a sense of collective ownership. This approach offered a relevant equivalent to the real world architectural decision-making process—a process that is at once collaborative and team-generated. Team-based aspects of this project allowed students to test their individual efforts against those of their peers. The atmosphere provided opportunities for valuable interaction, allowed information interchange,
fostered imagination, encouraged bottom-up learning, and inspired original hybrid creativity to emerge. Team experiences tended to mediate against promoting overly autonomous control over the design process—a valuable lesson with implications encountered later in professional practice.

**Stretching Sustainability**

This project attempted to further sustainable discourse by engaging with critical social and ecological imperatives. Design approaches were selected to reduce the waste stream, promote sustainable production, and enhance zero carbon/zero energy initiatives. The temporal, and in a sense, throw-away nature of interior environments was considered—resulting in the imposed constraint of local materials re-purposing. Ninety-five percent of the resulting ultra-light-weight built environment was created with pre-used stock provided by Materials for the Arts and collected through self-initiated reclamation efforts.

Revealing a contextual connection particular to North Brooklyn was central to this project. Environmental inputs were identified, documented, and then taken through a series of hand-generated and computational transformations. The resulting output was charted into a mapped sequence of moves rooted in this process. Ultimately, the interior environment’s site-specific identity, spatial sensibility, graphic symbolism, and materiality connected with implied origins in the context-formalized as an experiential space.

Exposing students to the client experience was perhaps one of the more challenging aspects of the project. Our client, a small alternative gallery in Bushwick, Brooklyn, provided a 400-square-foot gallery space as installation space and design directives. Their intentions heightened the need to work within client-imposed constraints, an inflexible opening schedule, and the expectation of a zero-cost installation.

**Manipulating Materials**

By allowing the investigation of ideas through hands-on manipulation, the simple act of making offers a classic and timeless tool for testing spatial concepts. Studying contextual and figural conditions through making revealed unexpected opportunities not typically found within hand-drawn or digitally generated architectural methods. Exploiting the ambiguity and juxtaposition of local form, materiality, structure, color, and texture for the cause of architecture, as well as for art, engaged these processes toward an interdisciplinary relevance applicable to both worlds. Our processes attempted to unearth influences unique to Bushwick.

Engaging architecture students directly with notions of making in other artistic disciplines was an integral aspect of this project. Young designers benefit from that greater sensitivity that is derived from experiences beyond the building scale. This project employed exercises architectonically relating to the disciplines of fashion design, interior design, and photography as up generators of unexpected opportunities. Five sequenced charrettes were introduced during the semester that highlighted the inter-relationship between the practice of making in various realms of art and design.
and its implication on problem-solving during the conceptual, design development, and construction phases of an architectural project. These exercises were carefully calibrated to gradually identify material, connective, and contextual consequences in ascending scale.

Each of the charrettes charged students with exploring the medium by researching materials and creating three-dimensional space. The process encouraged them to actively collaborate. Students were required to work in increasingly larger groups, which led to collective conceptual ideas to emerge. The phased sequence empowered far greater design freedom through its unconventional abstraction. The projects included the manipulation of an anthropomorphic object, an extensive materials investigation/exploitation, an exhaustive field photo shoot/analysis, and testing of component parts. Our first exercise identified the transformative potential of reconsidering the relationship of structure to skin.

**Structuring and Sheathing**

An introductory charrette focusing on human relationships between structure and skin was initially used to address the smallest scale of space-making. Vesalius’ De fabrica, with its series of intricate and detailed drawings of human dissections referencing allegorical poses, Le Corbusier’s Modular, and Leonardo’s Vitruvian Man were employed as classic precedent equivalents. As an intimate exploration of a body in space, the effort acted as a springboard for a series of explorations that culminated at the scale of a room.

To launch this process, the studio revisited an approach previously undertaken by Diller + Scofidio. Their investigation, Bad Press: Dissident Ironing (1993-98), explored the architectonic capabilities of Oxford shirts re-imagined through the everyday domestic task of ironing. By performing operational techniques against the shirts, such as buttoning, folding, and pressing, Diller + Scofidio revealed unanticipated opportunities for both the material and resultant wearable objects. Our studio re-employed their approach by using it to investigate joinery connections at actual scale, material performance, and the relationship of a body in space.

The inherent capabilities and anthropomorphic characteristics of a white Oxford shirt were tested to reveal material characteristics toward determining topological and functional potentialities of skin (shirt) and moving structure (body). The charrette required students to test operational techniques against the shirt, photograph the process, generate an instructional guide describing the shirt’s reconfiguration, and assembly of a graphic catalog of the transformed white oxford shirt. The process referenced linkages to building skins, whereby the fabric of the shirt assumed the role of a secondary, transformative, and performative layer for the body.

The power of language was engaged to approach architectural design from a reactive point of departure. Students identified qualitative terms that described spatial qualities, rather than subjective terms. These terms were used as generators of actions performed against the fabric and original assembly processes of the shirt. The end result was a wearable...
garment that better suited the owner due to its performative and constructive particularity.

**Sorting and Story-telling**

A parallel goal of the studio was to improve the visual communication skills of the students. The investigation of the previous exercise was deployed into the format of an illustrative catalog. Each student expressed the personal nature of their process by graphically representing it and showing their shirt with and without a body. Here, the process of making the catalog was linked to the processes of collecting, analyzing, editing, and framing. The subjective nature of photography and photographic processes was engaged.

Cataloging required students to clearly organize and disseminate their methodology into a series...
of clear and sequenced parts. Using hand-drawn and digital techniques, catalogs resulted in sophisticated and provocative presentations, specifically tailored to the identity of the author and their original construct. This storytelling process highlighted the sequence of material transformation, deconstruction, and re-assembly.

**Connecting and Conveying**

The third charrette familiarized students with how connective conditions can be identified, investigated, tested, and ultimately exploited by examining the connective relationship between two bodies in space. Offered several material choices and operational opportunities, students were asked to explore potentialities revealed by a material, and a pair of selected operations operating against it. The selection of materials and operations established a dialogue of active and reactive forces, as well as the interconnectivity of three primary elements—axial tube, a planar surface, and connective tissue.

Figure 2: A Transformed Oxford Shirt Catalogued by Silvia Portilla. (Source: Author).
The exercise abstractly introduced the future conditions of the site—a gallery space in an artists' kunsthaus. Students were offered an exhaustive suggested list of materials to exploit, as well as a series of primary and secondary forces to explore through the mediums. A specified cubic volume of space was used to circumscribe the exercise. Within this space, students were created a series of spatial models that manipulated an axial wood element, a planar wood surface, and connective tissue.

**Patterning & Postulating**

This phase of the project required students to formulate an emergent site-based approach re-imaging the Bushwick district through a collaborative lens. The charrette familiarized students with how site-based data could be used as a ground-up generator of space and form by considering the potential relationship between interior-designed form and a larger
urban context. Bushwick offered a richly diverse platform for historical, industrial, and demographic research. Site-relevant formal and material inspiration was identified through found objects, captured patterns, and observed behaviors operating across the district. Students explored, examined, and employed site-based influences through careful investigation and time analysis of conditions specific to this unique neighborhood.

**Hunting & Honing**

Viewing, capturing, framing, staging—these were the tactics engaged by the students to develop an original interpretation of Bushwick.

All that encompasses or surrounds a point in space defines that space. Therefore a place is defined by its contextual materials or surroundings. Using a digital camera, they embarked on a collaborative image-collecting field study of the neighborhood within a precisely one-mile radius of the gallery. The larger district offered an opportunity to key into material conditions, patterns, and forms as design generators. With the knowledge that a design-build endeavor can be derived from the immediate environment, students mined the Bushwick vicinity for data. Materials, colors, shapes and patterns were drawn from the surrounding urban geography.

Figure 4: The Field Photo Shoot. (Source: Author).
The task required collecting a large number of images that were then edited and selected. Multiple individuals or groups of individuals were involved in the image-capturing effort, based on various narratives of their own choice. Images keyed into patterns ranging in scale from broad-based to miniscule. These patterns were used as material generators, pattern references, and scaler generators for digitally-fabricated study models.

**The End Game**

A defined geographic area was defined for focused investigation and student teams were encouraged to collect found objects. Activities included the recording of visual and textural patterns at various scales, cataloging graffiti, and identifying material samples for testing and ultimate reuse. Materials were manipulated and connective operations tested, eventually revealing the potential for an environment constructed entirely of light elements such as repurposed masonite, metal wire, plastic, and colored paper. Testing was conducted hand-in-hand with pattern exploration applied to space-making. Student teams engaged a process of trial and error through postulating, hands-on building, and use of digital fabrication. The testing of constructs gave students a virtual library of potential building methods and material connections.

Figure 5: The Interior Space and its Digitally-Fabricated Ceiling-wall Installation. (Source: Author).
As student teams progressed through these stages, teams were combined when certain synergies in process and/or materials usage emerged. The narrowing field correlated with a greater ability to test environments at larger and larger scales without increasing time expended. Ultimately, two teams with compelling original proposals were considered. A logistical assessment was then conducted for each project defining the materials and time needed to fabricate and install each scheme. Once a clear strategy of time (low) and materials (free) had been established, students identified the most viable project and then converged as a single construction team for successful installation of the project.

**Emergence Critiqued**

Through this series of charrettes and resultant full-scale light construction, students gained valuable insight into place-making and space-making in a world where resource management, delivery distance, and adaptive reuse determine the real parameters impacting the environment. These circumstances should not be seen as limitations, but rather, as new opportunities of an architecture that speaks directly about place. Certain design decisions in this studio were made quickly due to time constraints. Thus, the investigation may have gained increased connectivity between place and space if, for example, production time was extended or materials were broadened—a greater importance could have been placed on more advanced structural capabilities. Likewise, the previous knowledge base and inexperience of this particular group of students added additional layers of limitation on the project. Future projects guided by this approach should more carefully consider the pre-existing student skill sets, available time, and materials available. A successful design process relies on both bottom-up and top-down methods of organization, and so, the process must remain open to the interplay of both forces throughout the process.

By engaging emergence, or a bottom-up approach, this studio attempted to reveal a broader and deeper approach to context in Bushwick. Here, we intended to apply a rigorous research investigation that translated circumstances into an event fixed in space. Yet, the project partially reflects the spirit of a place interpreted by designers with their own personal biases and/or preoccupations. This is the reality of emergence. For while it is indeed far more liberating than a conventional top-down approach, it would be naïve to assume that the human tendency to frame the world through one’s own lens can be entirely erased. And frankly, should it ever be? Future exploration of such notions will provide on-going topical research opportunities for this team of educators and architects. Such investigations will continue to ponder our own roles and original voices in the interpretation of both place and space as architects of a certain age.

-----------------------------

Gregory Marinic

Gregory Marinic is professor in the Department of Architecture at the Universidad de Monterrey where he teaches design studio, research seminars, and thesis. His previous teaching experience includes undergraduate/graduate studio and directed research at Pratt Institute and the City University of New York. Gregory is director and co-founder of d3, a New York-based organization that promotes trans-disciplinary design, and principal of Arquipelago, an
architectural practice engaging in design, research, teaching, and experimentation. Prior to independent practice, he worked in the New York and London offices of Rafael Vinoly Architects on academic, performing arts, and international competition design teams. Gregory holds a Master of Architecture degree from the University of Maryland, where he was the recipient of the Leonard Dressel Scholarship, Jack Kenton Scholarship, and the School of Architecture Thesis Citation. His work in architectural and installation design has been featured in exhibitions in Calgary, Cleveland, Detroit, New York, Monterrey, Savannah, St. Louis, and elsewhere. He can be contacted at gregorymarinic at yahoo.com