

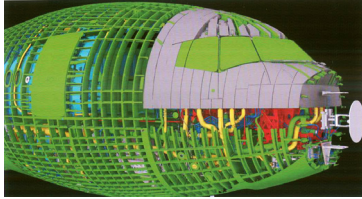
Columbia Building Intelligence Project CBIP 2014 Studio

Columbia University GSAPP

Design Critics: David Benjamin, Laura Kurgan, Scott Marble (CBIP Studio Director)

Software Consultants: Adam Modesitt, John Cerone, Jason Roberts

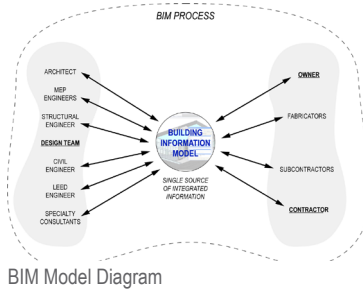
Student Software Assistant: Carlo Delano Bailey



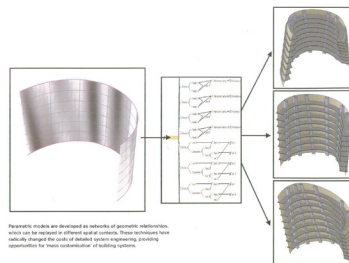
Boeing 777 Because of the capabilities of Catia to simulate a virtual prototype, the 777 was the first passenger jet to be designed without a full scale mock up. 5000 Engineers in 26 countries collaborated on the design of the project.

About CBIP

The Columbia Building Intelligence Project (CBIP) developed to explore new technology-enabled design collaboration in architecture. Driven by the increasing amount of metric-driven data relevant to the design of the built environment, advances in digital design tools and communication technologies and a new entrepreneurial spirit among a younger generation of designers, the goal is to foreground collaboration as a design issue for architects. The project also directly engages with current industry trends around new technologies and takes a critical response to the lack of creative options to Building Information Modeling and Integrated Project Delivery as viable methodologies.



CBIP began as a pilot research project in the fall, 2009 with a public Think Tank in New York that brought together leading experts from various sectors of academia and industry in an open dialogue about current and future trends in collaborative working methods. The first CBIP Studio followed this in the spring, 2010. Since then, we have had international Think Tanks in London, Tokyo, Stuttgart and Toronto along with yearly Think Tanks in New York that have served to inform and focus the Studio each year by bringing the insights of experts from around the world into the research of CBIP.

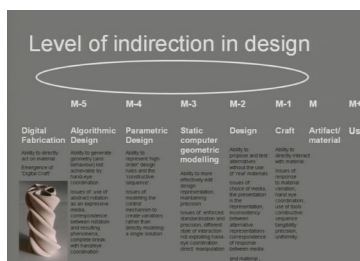


Parametric models are developed as networks of geometric relationships which can be replayed in different spatial contexts. (Dennis Shelden, Gehry Technologies)

Now in its fifth year, CBIP continues to evolve, building on the successes of the past years while continuing to focus the core questions of the research. Some of the more open-ended questions of the pilot phase have become more focused, while altogether new questions have arisen, which has pushed the studio to simultaneously become more rigorous and speculative.

Here are just some of the questions posited during the pilot phase that lead to the work produced by the students:

- What are the new models of collaboration in the context of increasing specialized design information?
- How can these new models expand the scope and capabilities of architects to embed the role of design in the total process of realizing a building?
- Is this leading to new forms of consultancies and practice and if so, do they take the form of large conglomerate organizations or small independent and agile nodes in a collaborative network?
- As individual projects and large aggregations of projects evolve to include more and more information, as well as more and more stakeholders, how might diverse and decentralized groups make intelligent design decisions?
- In architecture, is it possible to leverage “the wisdom of crowds,” as theorized by business writer James Surowiecki?
- Is there a way to take advantage of “crowd sourcing,” the contribution of many



by Robert Aish.

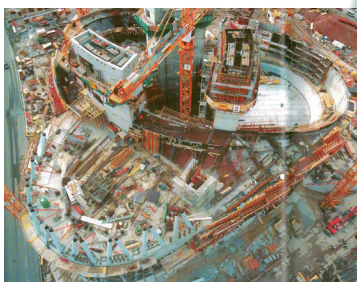
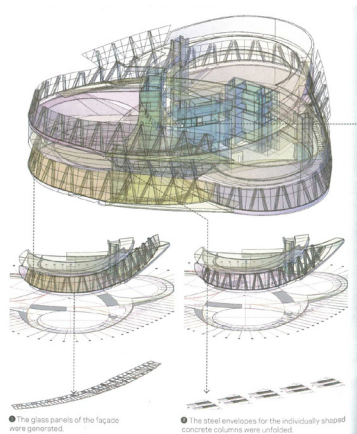
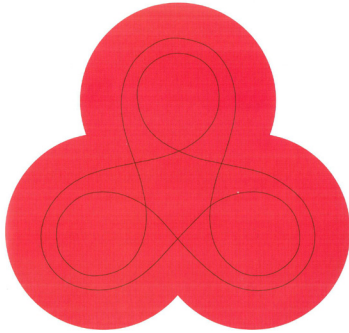
Digital processes in architecture have evolved from static computer drafting to dynamic parametric modeling that manages complex relationships between building parts. With digital fabrication, the connection to craft comes full circle as the work of architects now link directly to production.

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Mercedes-Benz Museum, UN Studio.
The parametric model for this project not only described the geometry of the design but also was used to produce fabrication information for many parts of the building. It was also used during construction to manage and update associative parts when changes were made to help coordinate the work of all trades.

distributed users toward a collective product?

- Can open source design methods pioneered for software development be applied to or reformulated for architectural design?
- Might an open source model start to change the one-off nature of buildings and reduce inefficiencies in the design and construction industry?
- How might multiple independent parties build successive versions toward the goal of a single deliverable?
- Could modules of buildings and 3D files be “checked out,” revised, and “checked in” by different architects, fabricators, and contractors over time durations that exceed a single project?
- If complex building components could be designed, documented, and released into a broad architectural community, how would intellectual property be handled?

CBIP Workflow

In this studio, we will experiment with the same sophisticated modeling and project management software currently used in industry for its most advanced projects. We will explore new forms of Building Information Modeling (BIM) and parametric modeling techniques that challenge conventional applications that are becoming industry standards.

As in past years, the core of the design workflow will revolve around *Dassault Systems* CATIA, a powerful software package originally used for design and production in the aerospace industry and now increasingly used for designing and constructing today's most complex architecture projects. Over the course of the semester, students will become fluent in CATIA as well as in other applications for simulating building performance and managing design information. Students will learn to create robust and reusable parametric models.

Unlike a typical studio in which students produce isolated stand-alone designs, the CBIP studio is based on a *design-and-release* model. The design task for each student will involve the creation of sophisticated parametric components (Elements) that can be formulated, tested, compiled and released for others to use. Each design Element will be created in CATIA, documented with an instruction manual, and then made available as a tangible research product that others can download, re-configure, and utilize. The Elements will be used in single instances, but their primary role is to be integrated with other Elements into comprehensive design proposals (Strategies). By the end of the semester, students will have designed dozens of individual Building Elements, as well as several Building Strategies, that will become part of the CBIP Library, which currently has over 90 Elements and 20 Strategies from previous studios.

While the studio will be software-intensive, no prior experience with specific software is required. And while the studio will use sophisticated parametric design applications

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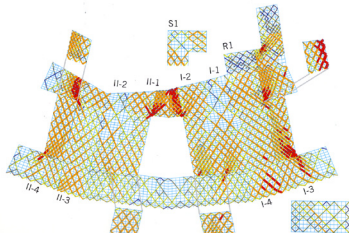
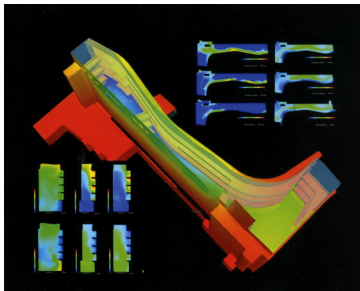


Diagram of axial stresses in modified perimeter structure (CCTV building in Beijing)

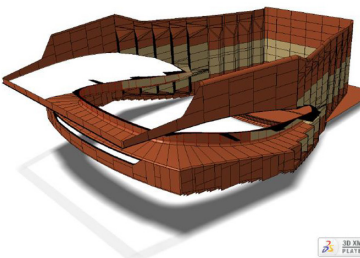
and other digital tools from engineering and computer science, *CBIP is a first and foremost a design studio*. Our objective is to combine the most creative thinking with the most advanced digital tools in an effort to push design to a new plateau. The studio will also incorporate more intuitive sketching software such as Rhino, as well as non-software-based design techniques. And it will take on the complex challenge of incorporating issues around culture, program, history, and aesthetics – issues that resist easy quantification – into the design workflow. Ideas, concepts, and imagination will drive the entire process



Multiple computational fluid dynamics (CFD) models for environmental performance in winter and summer. (University of Michigan Research Building)

New CBIP Partnership

For the first time, CBIP is also partnering with *Dassault Systems* (the maker of CATIA) to roll out its new 3DEXPERIENCE collaborative platform. *Dassault* has been developing this platform for several years as part of a concerted effort to transform the design and construction industry. After seeing the student work from past CBIP studios, they immediately saw new design potentials for their software as well as a shared ambition to completely rethink current conventions. With this new partnership, CBIP students will be the first users of this powerful new platform and the full suite of associated design tools.

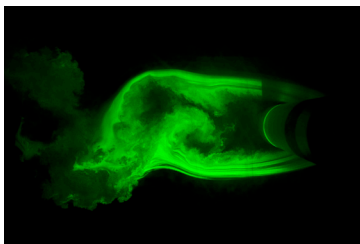


BIM Model of Lincoln Center Alice Tully Hall, Gehry Technologies. Diller, Scofidio & Renfro, Architects.

Studio Structure

CBIP 2014 will take a new approach to student and critic collaboration. The studio will be divided into three research units taught by Scott Marble, Laura Kurgan and David Benjamin and while each unit will have a unique focus, they will be closely integrated in content and method. In addition, CBIP will be a vertical studio comprised of both 2nd and 3rd year students. Each critic will provide a supplement to this general syllabus outlining the focus of their research unit in more detail.

Students will be based with one critic through all phases of the studio but will also have direct interaction with the other critics, as well as the expanded CBIP team. Students will work individually to design their Elements and will have the option to work alone or in groups of up to 3 to design their Strategies.



The use of parametric modeling and performance simulation software is often complemented by physical testing. Here, the massing for a tall building design is tested in a wind tunnel for the effects of vortex shedding. (Benjamin Advanced Studio 4)

The studio will be supported by software consultants who will conduct an initial “bootcamp” session on CATIA. There will also be weekly CATIA workshops throughout the semester that take place outside of studio time that will prepare each student with the necessary skills to develop design solutions and collaborate with others through methods of integrated modeling. During a typical week, each student will have two desk critiques with her GSAPP critic and one pin up with another research unit.

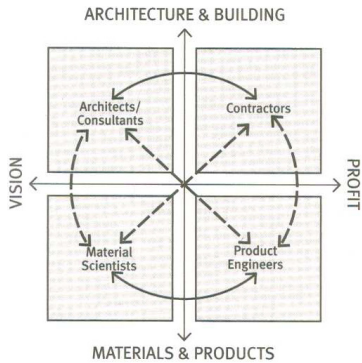
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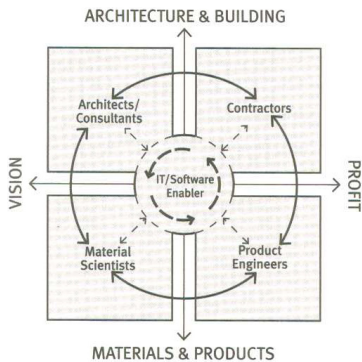
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Traditional Industry Relationships The four major disciplines need to cross the boundaries established by their traditional roles.



Enabling Collective Intelligence An entire new industry that produces communication / collaboration software has made it possible for the various parties involved in a project to have real time sharing of information. from *Refabricating Architecture*, Kieran & Timberlake

In addition to the expanded studio team, students will have access to a vast library of resources generated over the past four years including:

- Library of over 90 CATIA CBIP Building Elements from previous years < <http://c-bip.gsappcloud.org/library/elements>>
- Library of over 20 CATIA CBIP Building Strategies from previous years < <http://c-bip.gsappcloud.org/library/elements>>
- Video archive of over 50 short “pecha kucha” style presentations by industry leaders from the past CBIP Think Tanks
- CBIP Webpage with select material from the CBIP pilot project < <http://c-bip.gsappcloud.org/>>
- CBIP Tech Help webpage with dozens of software tutorials and technical resources <<http://cbiptech.ning.com/>>

The Columbia Building Intelligence Project is generously supported by Oldcastle BuildingEnvelope

Dassault Systems is an industry partner with CBIP



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MANUFACTURING 2.0

Critic: Scott Marble

New York City has historically been a center of manufacturing due to its abundant waterfront ports, railroad infrastructure and a large diverse population. After a steady decline that accelerated over the past 50 years, manufacturing is returning to New York in a new form. The disruption to local manufacturing caused by the rapid growth of a global economy during this period of accelerated decline is beginning to stabilize and cities are now assessing the impact and how to define the future growth. Unlike the large scale operations that were once a dominate economic driver and significant source of jobs, the new version is made up of smaller, more specialized technology-driven firms that respond to local demands than mass market appeal. This is not unique to New York as many major cities are undergoing similar changes, often with an emphasis on serving their geographically specific industries. This renewed interest in manufacturing also coincides with a new public consciousness about environmental and economic sustainability that demands a more nuanced understanding and response to local/global relationships.

Building on the many initiatives currently under way to address local manufacturing as essential to both economic diversity and sustainability in NYC, **this studio will develop scalable design strategies for design and manufacturing incubators**. The studio will address how several trends in NYC - the rise of the tech start-up sector and the public funding incentives for small scale manufacturing – can converge into what is being called **Manufacturing 2.0**. Also supported by new business models and flexible funding platforms like Kickstarter, social collaborative environments like Quirky, and a renewed interest in locally made products, Manufacturing 2.0 has the potential to redefine an industry historically defined by large, dominant companies into a stable network of smaller, more specialized entities.

As a base for much of the large scale manufacturing of previous centuries, much of the existing fabric of New York is made up of industrial and manufacturing buildings that have either been repurposed for other uses or sit empty. As a prototypical site for this studio we will use one of the largest remaining enclaves of these building types in the city. *Industry City* is made up of 16 buildings with over 6.5 million square feet of space on the Brooklyn Waterfront. Students will define the specific area of work as part of their design solutions and the scope can range from modest interventions into a single building with a high level of detail to larger scale strategies for the entire site.

Manufacturing 2.0 is one unit of the CBIP collaborative studio and we will share a common workflow with the other 2 units as described in the attached general syllabus.

