Carnegie Mellon School of Architecture
Advisory Board Briefing Book
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School of Architecture Advisory Board Briefing Book EXECUTIVE SUMMARY

A top-ranked institution in the world, Carnegie Mellon manifests itself as a research university of a unique character, "where art and technology meet to create innovation with impact". Founded in 1900, the university has a distinguished history and a determined future for educating leaders across domains of teaching, practice, research, scholarship and service. Carnegie Mellon is a leader among educational institutions by building on its traditions of innovation, problem solving and interdisciplinary collaboration to meet the changing needs of society.

Celebrating its 100th anniversary in 2006, the College of Fine Arts enjoys a century of impact and recognition related to its notable legacy as a "School of Fine and Applied Arts". The College is comprised of several interdisciplinary programs, research centers, and five schools including two performing art conservatories -- the School of Music and The School of Drama – as well as Architecture, Art, and Design. The College mission is to provide a challenging, encouraging environment where students and faculty maximize their artistic and intellectual potential through open critical inquiry and creative production.

The School of Architecture, with 60 faculty, 11 staff, 274 undergraduate students, 14 master students, and 29 PhD students, offers 10 degree programs: a professional Bachelor of Architecture degree, 6 master degrees and 3 PhD concentrations. Complimentary to these programs are five centers, labs and institutes: The Center for Building Performance and Diagnostics, The CoDe Lab, The Digital Fabrication Lab, The Remaking Cities Institute, and the Sustainable Design Academy.

MISSION, EDUCATIONAL OBJECTIVES AND DIRECTIVES

The School of Architecture has both benefited from and contributed to the context of Carnegie Mellon, The College of Fine Arts and the region. Entering the 21st century, the School established its mission, educational objectives and strategic directives as:

Mission
To educate future professional leaders with design creativity, global environmental consciousness, historical perspective, social responsibility, and technical competence.

Educational Objectives
- In the architectural design teaching process, the School shall emphasize the unique opportunities of studio-settings as excellent educational laboratories for analytical reasoning, creative exploration, exchange of ideas, integrated practice methods, and critique.
- In the transmission of scientific and technological foundations of architecture, the School shall apply and be measured against the highest standards of university-level engineering and science education.
- In response to the cultural evolution, the School shall acquire and develop advanced educational, professional, and research media and instrumentation such as computational tools and diagnostics equipment and promote their creative and pedagogically well-integrated use in all educational settings.
- In recognition of continuously changing professional requirements, social conditions, environmental challenges, and technical innovations, the School of Architecture shall promote a highly investigative and research-oriented professional attitude emphasizing the preparation needed for life-long learning.
- Building upon the School's and University's multi-cultural student and faculty bodies as well as the fundamental orientation, global nature, and multi-disciplinary strength of their research, the School of Architecture shall promote an active, open, and a future-oriented intellectual climate for the education of individuals who can act as agents of change and improvement in social and environmental conditions in this country and abroad.

Strategic Directives
- To be recommended as THE architectural school in the USA which graduates outstanding professionals with design creativity, historical perspective, social responsibility, technical competence, and global environmental consciousness.
- To be recognized as a leader in the acquisition, generation, and dissemination of knowledge in the field and one that effectively integrates advanced graduate-level research with undergraduate education.
- To be identified as the best among research programs of architectural schools in the USA and the one which graduates leading candidates for key positions at other architectural schools and research institutions in this country and abroad.

Today, the School of Architecture advances a shared vision to be recognized as a global leader of **integrated design** education, practice, research, scholarship and service. As one of (if not the first) PhD in Architecture programs in the country, the School enjoys a prominent record of research, and has populated the globe with graduates of significant stature. Through long-term strategic academic, government, industry, and practice partnerships we have defined innovative and collaborative approaches to research and scholarship within the School, while continuing to educate students for leadership roles in professional practice and a wealth of other environments.

INTEGRATED APPROACH TO DESIGN, PRACTICE, RESEARCH

During a decade of leadership under Vivian Loftness, FAIA, the School became known as an international leader for sustainable design education and research. The School's efforts and significant number of dedicated faculty in this field have contributed to environmental education at CMU and to establishing Pittsburgh as one of the nations "green design" capitals.

Building upon the School's strengths and reputation, beginning in 2004, under the headship of Laura Lee, FAIA, our vision has evolved toward becoming a leader of integrated design education, practice, research, scholarship and service. As such, we have extended our mission *to provide a balanced and integrated study of architectural practices, processes and systems*. The School aims to influence the direction of architecture education and practice through new and comprehensive educational models of integrated design and practice *to prepare students for change through an intellectually challenging and disciplined exploration of architecture.* The School's programs in **outreach,** undergraduate **professional** degree, master of science **practice specializations**, and PhD **research** connects architecture education with internship and practice, and ultimately life-long continuing education and professional development.

In the School, **Integrated design education and practice** means

To develop the capacity for analytical, critical and synthetic thinking within a given context
To adopt a systems thinking approach to design, utilizing analog and digital tools (BIM)
To apply research methods and technologies for collaborative decision-making
To acquire disciplinary knowledge through case studies / case method
To dialogue in trans-disciplinary and inter-cultural settings
To engage and serve communities, toward sustainable futures
To master the design-build process conceptually, methodologically, and technically

This integrated approach is based upon well-conceived collaborations within the College and University as well as locally, nationally and internationally. The School of Architecture is a partner in numerous programs and projects within CFA and across the campus. The School is to be commended for the number of joint faculty appointments and degree programs, as well as collaborative courses and research at CMU and beyond. Exemplary amongst theses are three Solar Decathlon projects involving 5 institutions and 70 students across 7 majors; the Center for Building Performance consortium with over 40 academic, government and industry partnerships; the Urban Lab and newly launched Remaking Cities Institute, which engages countless communities and local foundations and organizations. Our outreach programs alone now reaches more than 650 students annually. The School's networks have resulted in immeasurable benefit to students, faculty and the societies we serve.

ASSESSMENT

Since the last Advisory Board visit in 2001, several other assessments have been recorded from various sources. In 2004, a summary of reports over 10 years was compiled and, as a conclusion, the general strengths of the School are defined as:

Faculty: diversity, reputation in research, and impact of practicing faculty in teaching design
Students: intelligent and hard-working; many pursue minors and double majors
Academic, government and industry partnerships
Integrated design and media approach
Integration of education, practice, research, scholarship
Interdisciplinary collaboration in the college and university, nationally and internationally
Graduate research applied to undergraduate education; graduate research applied to practice
Graduate research in building performance, computational design, sustainability
Multi-cultural community: faculty and students with diverse backgrounds
Practice education / preparing students for the profession

The School continues to develop on the basis of these strengths. Detailed evidence is included within the full briefing book.

Similarly, the weaknesses of the School were commonly identified as follows:

- Diversity in faculty and students
- Expression of the art of architecture and theory of design
- Faculty balance: tenure to tenure track; full time to adjunct
- Fragmentation of focus; sum of the parts not greater than the whole
- Inflexibility in curriculum / rigid structure of required courses
- Integration with the College of Fine Arts
- Lack of non-architecture courses
- Lack of thesis
- Teaching of social responsibility
- Computational Design Program viability (stated weakness unique to the Advisory Board reports of 1998 and 2001)

Following this 10-year assessment, in 2005, the National Architectural Accreditation Board reviewed the School noting excellence in several areas, aligning with its mission. Conditions and student performance criteria **well met** included:

Architecture Education and Society	(on-site studies, quality of research, sustainability, urban lab)
Collaborative Skills *Ability*	(graduates transition easily into and contribute to practice)
Human Behavior *Understanding*	(breadth of awareness of users, in-depth reports)
Site Conditions *Ability*	(ecology and environment)
Ethics and Professional Judgment	(noting use of case studies)

In addition, the NAAB team made these general comments about the School's program:

- Faculty are committed and productive; Students are energetic and intelligent
- Commend: studios express real world commitment
- Commend: mission of integrated design in first two years
- Commend: professionalism of School and preparing students for practice
- Commend: exceptional quality of courses - cited as exciting and rigorous
- Could benefit from: greater liberal arts education, experimentation with other materials
- Cause for concern: graphic skills in upper level studios
- Cause for concern: diversity in the School of Architecture and campus wide

The NAAB cited the School for not meeting conditions and student performance criteria in these areas:

Human Resources	overly dependent on adjunct faculty; need for full-time faculty leadership in design
Physical Resources	shop too small, equipment out-dated, lack of equipment to work with array of materials lack of spray booth, 3-d digital equipment / CNC milling machine, space and support
Professional Degree and Curriculum	(60% required courses, 40% elective courses not respected)
Accessibility	(evidence of adherence to code issues in all studio courses)
Comprehensive Design	(need to retain knowledge from years 1-3 in years 4 and 5)

PROGRESS

Since 2001, the SoA has realized significant change and has achieved notable progress in response to the last Advisory Board report, the 2004 comprehensive assessment, and the subsequent 2005 NAAB report. Embracing the major recommendations of the 2001 Advisory Board, our progress has been with respect to:

Faculty Recruitment

In response to the imbalance of full time to adjunct faculty, and from a technical emphasis to a more balanced design orientation in the undergraduate curriculum, the School is engaged in aggressive and directed faculty recruitment. The following developments have occurred:

Faculty searches in the past three years have resulted in the following tenure track design faculty hires with design emphasis:

2004 / 05	Kelly Hutzell	MArch Columbia	Caste Assistant Professor
2005 / 06	Jeremy Ficca	MArch Harvard	Assistant Professor
2006 / 07	Pablo Garcia	MArch Princeton	Assistant Professor

Faculty searches in pursuit of **leadership in design** will be conducted in the coming years as follows:

2007 / 08	Caste Visiting Assistant Professor in Architecture and Urban Design
	Fitzgibbon Visiting Professor
	2 Visiting Faculty
	2 Tenure-track Faculty
2008 / 09	2 Tenure-track Faculty
2009 / 10	2 Tenure-track Faculty

In addition, the School has made progress by:

Re-engaging tenured faculty in teaching undergraduate design studios and thus, research knowledge transfer
Elevating long term and award winning adjunct faculty to leadership positions in design, practice, research
Leveraging three existing and establishing seven new courtesy and joint faculty appointments
Continuing to recruit to address the diversity imbalance

Faculty Hiring, Promotions and Transitions

Three full-time faculty retired (Ulrich Flemming, Delbert Highland, David Lewis)
Two faculty received tenure (Laura Lee, Diane Shaw)
Two faculty received University appointments (Doug Cooper, Andrew Mellon Prof.; Vivian Loftness, FAIA University Prof.)
Two faculty from the 2001 Advisory Board hired (Khee Poh Lam, PhD, RIBA; Mark Gross, PhD both as Professors with Tenure)
Twenty-six new adjunct faculty were hired, the majority teach in design studios or practice area of the curriculum

Faculty Support

In response to faculty overload, the School has increased support and clear policies have been established as follows:

2004 Yearly grants for professional development established for all full time faculty $1500 each (now $1850 per year)
2004 Yearly grants for professional development established for all adjunct faculty $20 per teaching unit (now $25 per unit)
2004 Yearly grants for student development established for 18 design studios @ $2000 each (now $2750)
2004 Standards for providing increased # of Teaching Assistants and lab monitors, with clear policies and compensation rates
2005 Travel allowance for faculty to accompany students on field trips @ $600 per faculty member for 3 days excursions
2005 Increase in faculty office spaces and standards, with provisions for computing and equipment, and special projects
2007 Reduction of faculty load from 4 to 3 courses recognizing PhD advising, administration, research and service
2007 Increase in adjunct faculty compensation at an average of 22%
2008 Introduction of Sabbatical Program with internal funding

While progress in faculty support is leading to greater equity in faculty loading, the full-time faculty remain overstretched, especially when there is a need for mentoring of junior and adjunct faculty who continue to carry the undergraduate curriculum. Likewise, there is a perception that researchers have advantage over artists, scholars, and practitioners. A more dedicated assessment program for full-time faculty by the Head is needed for recognition of accomplishments and for merit increases. Similarly, the lack of performance evaluations makes it difficult for adjuncts to advance, although recent changes including salary increases, reduced faculty student ratios and a new professor of practice track are cited as improvements. The introduction of long overdue faculty colloquia series this fall intends to increase knowledge sharing across areas of faculty expertise.

Within the next decade, the School will experience retirements which may have a dramatic impact on the School's budget if faculty elect early retirement options and current policies must be met.

Administration and Staff

To accommodate an expanded mission and to accomplish substantial change and growth, the School reconceived the administrative staff in its entirety. Several new staff were hired under new titles, with revised job descriptions, and increased responsibilities. Undertakings such as the new admissions process, the construction of the digital fabrication lab, and preparation for the advisory board would not be possible without new staff and the recruitment and hiring efforts supported by the University.

NEW staff positions and hires include:

Dave Koltas	Business Manager
Heather Workinger	Senior Academic Advisor
Kristen Frambes	Senior Administrative Associate
Alexis McCune	Coordinator of Student Programs
Amy Bickerton	Office Assistant and Webmaster

The most important and needed staff hire is a Computing Manager, capable of strategic planning and overseeing the new digital fabrication lab. The market rate for such an IT staff will stretch the School's budget.

The new staff have contributed to increased communication internally and externally, although all programs and projects in which we engage are in desperate need for additional staff time and resources for promotional publications. The need for dedicated funds for revising and maintaining the website could not be greater to increase our rankings and reputation.

Undergraduate Program and Curriculum

Embarking on a plan toward an integrated design education, the undergraduate program and curriculum have experienced substantial changes in the past three years. Within the curriculum, we are working to ensure horizontal and vertical connections to fully achieve integrated design. We are more carefully developing assessments to measure cumulative learning throughout the studio sequence. The reduction of required courses has opened the possibility for 7 architecture electives and 7 university electives, thus promoting a greater liberal arts education, increasing possibilities for minors and double majors, and advancing interdisciplinary study. Approximately 75% of our students study and travel abroad during their five years in the program. Introduction of a thesis studio in the spring of 2008 intends to recognize student's individual aspirations for future careers.

Changes in the curriculum have been made to emphasize design creativity, innovation and experimentation. Frequent distinguished guest critics are a regular part of the program, along with a new dedicated high-profile lecture series. Design build projects -- analog and digital -- have become more prevalent throughout the curriculum. Social responsibility is entering the discussion in all years although we still need to engage other stakeholders in the studio (clients, consultants, community, etc.)

Specific and incremental changes to the undergraduate program have been:

2004 fall	Granting of studio funds per year / per semester for **student travel experience** and **visiting critics program**
2004 fall	New **Studio Review** Format: all faculty in all years attend all reviews along with local and national guest critics
2004 fall	Monthly meetings of **studio coordinators** discuss knowledge exchange across years and across the curriculum
2005 spring	Introduction of **Real Estate Design and Development** in collaboration with Heinz and Tepper Business School
2005 spring	New **Lecture Series** with involvement in studio reviews. Series includes one alum and one faculty each year
2005 fall	Requirement for each student, each semester to produce portfolio quality **studio documentation** for exhibit
2005 fall	Shift in **software** use from limited palette to: Maya, Rhino, 3d Studio max and now Sketch-up and Revit
2005 spring	**Coordinator roles** of faculty for each year program established as equivalent to one course loading
2005 spring	Introduction of in-house **sponsored competitions**: Epic Metals, NCMA, Velux Corporation
2006 fall	**Integration** of third year studio with Site Engineering and Environmental Systems
2007 spring	**Integration** of fourth year studio and Advanced Building Systems
2007 fall	Introduce new **admissions** process including essay, interview, portfolio (optional)
2007 fall	Move to **vertical studio** selection process in fourth and fifth year programs
2007 fall	Re-conceive first, second, third year programs as foundation
2007 fall	**Faculty student ratios** in studios average 11:1
2008 spring	Introduction of **Thesis** program
2009	Master of Architecture?

Revision of the admissions process in 2006 to included a required questionnaire, as well as optional interview and portfolio has been a major undertaking for the School. Our intention in this process is to assess students' preparedness for architecture education and for the rigor of Carnegie Mellon. The mechanics of the process and results are described in more detail in the main report. While the new process promises a stronger entering class and greater retention, it has placed new demands on the faculty and requires 50% of a full time staff person. As we are now embarking on recruiting trips, the financial toll of this process has placed significant pressure on an already stretched operating budget.

A strategic initiative for the School in the coming years is to increase our interdisciplinary focus through on-campus and community connections, to increase international experience through study abroad and faculty exchange programs and to increase the internship program through engagement with professional practices. For this, we will need resources for such educational enhancements to be available to all of our students.

Graduate Programs

The graduate program has introduction four new degrees since 2003. Offered as 9 or 12 month post-professional specializations, these degrees take advantage of joint programming and aim to connect the undergraduate program with the graduate program, to connect education and research with practice, and to connect the School of Architecture with other departments on campus.

2003 Master of Science in Sustainable Design
2004 Master of Science in Architecture, Engineering and Construction Management
(joint with Dept. of Civil and Environmental Engineering)
2004 Master of Urban Design
(collaborative with the Heinz School of Public Policy and joint with Oxford University, UK)
2007 PhD Architecture Engineering Construction Management
(joint with Dept. of Civil and Environmental Engineering)

Research Awards and Grants

Research has been a hallmark of the School of Architecture for 30 years. While the School suffered from the impact of 9/11, research funding has doubled since 2000 and achieved great diversity along with significant awards. In addition, the School has also raised funds for three Solar Decathlon projects in 2002, 2005, and 2007 averaging $400,000 each.

Research, Awards, Grant totals	2000	$1,907,964
	2001	$1,004,813
	2002	$ 692,676
	2003	$ 711,359
	2004	$2,380,089
	2005	$2,548,505
	2006	**$3,882,295**

Featured research listed below is collaborative across the University and with other institutions and covers over 20 areas of specialization. Most notable and recent are:

Omer Akin	Functionalizing Product and Process Models for Embedded Commissioning of Low Energy Buildings
Mark Gross	Computational Construction Kits and Craft
Volker Hartkopf	Advanced Building Efficiency Testbed, Intelligent Workplace Energy Supply System (IWESS)
Ramesh Krishnamurti	Computer Aided Design for Sustainable Building
Kristen Kurland	Diabetes Prevention and Treatment Programs for Western Pennsylvania
Khee Poh Lam	Integrated Concurrent Design of High Efficiency Commercial Buildings
Vivian Loftness	Buillding Investment Decision Support (BIDS) Health and Productivity
Irving Oppenheim	MEMS (micro-electro-mechanical systems) Devices for Structural Sensing

Centers, Institutes and Labs

The **Center for Building Performance and Diagnostics** (CBPD) and the Advanced Building Systems Integration Consortium (ABSIC) will celebrate its 20th anniversary this year, and the construction of the Intelligent Workplace, its 10th anniversary. The CBPD remains more vital than ever as a living laboratory and test-bed facility. Research efforts are now directed to the IWESS (Intelligent Workplace Energy Supply System) and the Building as Power Plant (BAPP) project, a 60,000 square foot building proposal for the Carnegie Mellon campus.

Four new centers, institutes and labs have also been established since:

Computational Design Lab (CoDe Lab)

The CoDe (computational design) Lab started in 2004 is a small research laboratory in the School of Architecture. Directed by Mark Gross, CoDe Lab students engage in a variety of projects at the intersection of computation and design: architectural robotics, sketch recognition, and computationally assisted design critiquing.

Digital Fabrication Lab

A new 1750 square foot facility has been established for the School of Architecture with direct support of the Provost, Mark Kamlet. The fabrication lab is centered on five pieces of complementary equipment (categorized as two-dimensional and three-dimensional additive and subtractive processes), plus a spray booth facility.

Remaking Cities Institute (RCI)

The Remaking Cities Institute (RCI) is an educational, research and practice resource for the Pittsburgh region, created to promote an improved quality of life through place-making and carefully planned economic and community redevelopment. The mission of the Remaking Cities Institute is to catalyze sustainable urban futures and excellence in community design. The RCI vision is to be recognized internationally as the key resource for rebuilding urban communities, demonstrated through the revitalization of communities in the Pittsburgh region.

Sustainable Design Academy (SDA) Executive Education

The Sustainable Design Academy provides working professionals access to and engagement with the most current research on sustainable design practices. The SDA builds on the expertise within our world-renowned research center, Carnegie Mellon's Center for Building Performance and Diagnostics, to tailor a program that meets the unique needs of those with prior experience in design and construction fields such as architecture, landscape architecture, engineering, construction, planning, public policy, product design, ecology, and other disciplines. The program addresses the cross-disciplinary nature of sustainable design as well as skills and competencies that are specific to the core disciplines of design and construction.

Outreach and Diversity

K-12 Architecture Explorations

With the appointment of a full time staff member, Kelly Docter, in 2004, the School delivers a full compliment of K-12 outreach programs serving over 600 students annually. While Kelly is considered full-time, she raises ¾ of her salary through grants. Kelly's programs connect the School with minority student recruiting; students in the high school program are eligible for pre-college scholarships. This experience intends to prepare students for architecture education at CMU.

Pre-College Program

With a renewed focus and agreement for profit sharing with the University, the pre-college program enrollment soared from 12 in 2003 to 56 in 2007. Each year, five minority students receive full scholarships for this six-week program. In 2006, 22 of a possible 28 eligible students applied to the School of Architecture. Of those, 8 were admitted and enrolled in the first year class.

Summer Internship for Diversity (SID)

Each summer, the School hosts three students from Howard University. In a full six-week program, these students, in their final year of the Bachelor of Architecture program, partake of the graduate program offerings in the School. The program intends to and has been extremely successful in enrolling SID students into our Master degree programs.

Passport

Initiated and offered by the School of Architecture, Passport is a university wide, interdisciplinary course designed to encourage and facilitate student engagement in events across the College, the University and the City of Pittsburgh. Passport requires students to attend pre-approved lectures, workshops, exhibits, films, performances and various other events sponsored by the College, the University, or a variety of institutions and organizations in Pittsburgh. During the past academic year, Passport enrolled 67 students from first years to doctoral students from five of seven colleges.

Lecture Series, Guest Critics, Exhibitions

To promote knowledge exchange and foster an intellectual climate the School hosts a premier lecture series and engages dozens of local and visiting critics in the studio program. With the renovation of CFA 214, student work, including design awards and study abroad are regularly featured. Alumni and other public events are hosted at the School to showcase our work.

Special Programs and Projects

The School has moved toward several collaborative and sponsored projects over the past five years. Several are characterized by interdisciplinary, hands-on learning and collaborative production. Projects generally lead to public exposure locally and internationally through exhibitions and publications.

Solar Decathlon(s) 2002, 2005, 2007

The Solar Decathlon competition directly addresses the educational mission of Carnegie Mellon. Competing in a prominent international student competition and placing a student–built structure as an educational resource dedicated to environmental issues is symbolic of everything Carnegie Mellon stands for – fusing art and technology, collaborating on a multi–disciplinary basis, improving energy effectiveness and environmental responsibility, learning in a hands–on fashion and impacting regional and global issues.

Collaborative Project Courses

Close allies for collaboration, students in the School of Architecture have built stage sets for the School of Drama and benefited from an annual lighting design course with full access to state of the art facilities. Results of these project courses are full-scale installations developed under real world constraints and opportunities.

Foundation Sponsored Courses

For three consecutive years, the Enkeboll Foundation for the Arts and Architecture has sponsored students projects affording cross disciplinary, cross cultural experience, and resulted in major public exhibitions and publications.

Industry Sponsored Competitions

Three industry partners sponsor internal studio competitions: Epic Metals Corp, the National Concrete Masonry Association, and most recently, the Velux Corp. Each partner awards the School $7,000 - $10,000 to support student work, support faculty effort, award prizes and sponsor a lecture in the spring series.

Sponsored Design Build Courses

Scott Smith, Director of the Shop, has been a champion in leading commissions for design build projects sponsored by local galleries and museums. Products are exquisite examples of advanced wood and metal work.

Alumni Relations and Development

With 2377 alumni, receptions held per year have increased in the past three years from 2 with attendance of 140 to 5 with attendance of 266. Each year, the school hosts independent events on campus and Carnival Brunch. The lecture series now includes a prominent alumnus/ae and has been very successful in highlighting the achievements of our graduates. We regularly invite local alumni to participate in design reviews. Four alumni have received achievements awards from the university. News briefs sent together with the annual appeal have resulted in increased annual giving from $40,000 to approximately $65,000.

Despite increased activity, there is still a need for a reliable database, increased communication and programming of events.

RESOURCES

Finance and Fundraising

1. The School maintains a balanced budget each year. In fact, the School contributed $50,000 to the CFA debt in 2006
2. The School restructured the budget to ensure equity in support of special programs, travel, scholarships, faculty and students
3. The School negotiated to share profit of the Pre-College summer program with an average annual income of $40,000 (the School raised enrollment in the program from 9 in 2004 to 56 in 2007)
4. Alumni giving has increased from $35,000 in 2004 to $63,000 in 2007 through a restructured annual appeal process
5. Endowment *related to* the School has increased from $1.8 million in 2004 to $4.1 million at present
6. Annual awards to faculty and students have increased from $100,000 in 2004 to $335,000 in 2007
7. The School (Steve Lee) has raised funds to support three Solar Decathlon projects averaging $425,000 in 2002, 2005, 2007
8. The School reached $3,867,000 in research, awards, and grants in 2006
9. In kind donations have totaled over $750,000 in the past three years
10. The School has balanced the budget of the Center for Building Performance since July 2005

Fund-raising needs dedicate administrative, faculty, and staff effort, which would allow us to take advantage of our alumni base. We need increased and dedicated funding for the highest quality speakers and visiting faculty. We have embarked on fund-raising for three endowed chairs, which would allow us to reallocate resources for operations.

Facilities and Equipment

The School has achieved substantial improvements in its physical resources to enhance the quality of education for students and better support faculty and staff. Apart from a common facility, the School's latest need is a dedicated and staffed media center with high-end output devices to support such an intense computing environment.

2004

Renovation of main administrative offices College of Fine Arts #201	$ 25,000 + $75,000 in- kind donation
Renovation of MMCH 409 into Master of Sustainable Design Studio	$ 35,000
Renovation of MMCH 408 into CoDe Lab	$ 5,000

2005

Renovation of main design studio CFA 200 and addition of 34 movable crit panels	$ 60,000
Renovation of CFA 214 into new computer lab, crit / exhibition / lecture space	$ 80,000
Renovation of MMCH 102 into Master of Urban Design studio and community lab	$ 40,000 in kind donation Mosites
Shop expansion of 900 square feet	

2006

Renovation of MMCH 308 into computer lab for first, second, third year students	$ 30,000
Renovation of MMCH 310 first year yellow studio for additional crit space	$ 15,000
Creation of an exclusive metals shop as part of the architecture woodshop in CFA	$ 10,000

2007

Renovation of MMCH 410 main space and faculty offices and conference room	$ 40,000
Creation of adjunct faculty office suite	$ 2,000
Creation of digital fabrication lab	$500,000 from Provost

Computing: increase in number and distribution of high-powered graphic, dual screen work-stations and software
The School has invested in new computers and state-of-the-art software as follows

2004/05	24 existing machines	24 for 260 students	1:11 ratio
2005/06	28 additional machines	52 for 260 students	1: 5 ratio
2006/07	24 additional machines	76 for 260 students	1: 3.5 ratio

STRATEGIC INITIATIVES _ INTEGRATED DESIGN, PRACTICE, AND RESEARCH

The Carnegie Mellon School of Architecture (SoA) recognizes that "Integrated Design and Practice" has begun to radically transform the profession, allowing architects to realize more fully their potentials as designers and collaborators, while expanding the value they provide throughout the project lifecycle. We are committed to delivering education for, and performing innovative research for, the "Citizen-Architect of the Future" that is, professionals who will be practicing in the future in a more integrated manner, and who will be defining our future through attention to architecture and the built environment within the context of a global environment. To this end, the SoA seeks to expand leadership by dissolving the boundaries between education and the profession, especially in bringing integrated design practices into the academy, in collaborating with all constituent members of the project lifecycle, and in disseminating valuable research results to the design and building industries. Working towards this initiative provides a means to integrate the many research and teaching strengths of the SoA, and coalesces the School's other strategic initiatives: Urban Design & Community Development, the Sustainable Design Academy as executive education, Practice Management, Inter-Disciplinary International Internship Experience, and as a platform for collaborations across the University. The SoA's existing and proposed initiatives, contexts, opportunities, partners, programs, and research agendas make it uniquely situated to carry out this vision.

1. URBAN DESIGN AND COMMUNITY DEVELOPMENT

The School of Architecture is reputed locally, nationally and internationally for its work in urban design and community development, taught through its recognized participatory design process. The Urban Laboratory, unique within a Bachelor of Architecture program, is a required 4th and 5th year design studio and also serves as the centerpiece for the Master of Urban Design program. The newly launched Remaking Cities Institute (RCI) acts as a facilitator of the Urban Lab and the Master of Urban Design (MUD) curriculum outreach programs, wherein three interrelated initiatives serves revitalizing communities in the Pittsburgh region. On international fronts, in the spring semester of 2008, the School of Architecture will offer the first College of Fine Art (CFA) interdisciplinary courses at the Carnegie Mellon campus in Doha, Qatar. With current Carnegie Mellon initiatives promoting global education, the School of Architecture has worked to establish academic and professional collaboration in Qatar and aims to continue a program of research-based design education of great benefit to the School of Architecture, CMU Qatar and the municipality of Doha.

The School seeks to strengthen and support the three interrelated existing local urban initiatives, which are founded on a curriculum based outreach model: the Urban Laboratory, the Master of Urban Design program (MUD), and the Remaking Cities

Institute (RCI). The School seeks to strengthen SoA globalizing education course offerings by establishing a continued program of research-based design studies for the mutual benefit of SoA, CMU Qatar and the municipality of Doha based on the pilot offered at the CMU Qatar campus in the spring of 2008.

2. SUSTAINABLE DESIGN ACADEMY _ EXECUTIVE EDUCATION

The Sustainable Design Academy helps professionals innovate by acknowledging mutually beneficial relationships between the academy and practice. Architectural practice has been transformed by technologies that have changed our knowledge needs, continuing education needs and means of communication. Traditional hierarchies are flattened and roles are redefined wherein that the academy and practice need to intensify their relationship. The Sustainable Design Academy is structured to bring professional and academic strengths together around the topic of sustainable design.

As building industries adopt sustainable design ideas as part of common practice, there is a strong need for professional education to develop competencies, build awareness of systems, integrate the efforts of different disciplines and create networks among practitioners. Professionals who are leading the way in the sustainable design efforts bring unique skills and experiences to the classroom and have specific needs from a continuing education experience. Currently the national and regional efforts to provide educational opportunities are scattered, but none comprehensively address the myriad of fields involved in sustainable design.

The School of Architecture (SOA) at Carnegie Mellon University is developing the Sustainable Design Academy, a program to meet the needs of practicing professionals. Based on the SoA's Master of Science in Sustainable Design, the Sustainable Design Academy provides important content for professionals in the various design and construction fields. The program helps transform individuals, practices and the industry by making available world-renowned sustainable design knowledge of the School of Architecture. In return, the program is constantly enriched by professionals who bring experience from the "front line" and inform future research, direction, and mission.

3. PRACTICE MANAGEMENT and Center for the Advancement of Service and Corporate Architecture and Design (CASCAD)

The SoA envisions the "Architect of the Future" as a practitioner who embraces the *business* aspects of the field as well as its *creative* dimensions. Architects, through the expansion of their own expertise into areas like business, management, economics, information, and building technologies, are achieving greater impact and quality in their work. The SoA sees itself as a key agent in this development, poised to provide appropriate skill, knowledge, networking, and opportunity to facilitate, even accelerate, these advances in several key areas: service design, professional partnering, real estate economics, information based decision making, design value advocacy, and ethical conduct.

Towards this end two strategic initiatives have been developed: (1) strategic partnering with practice areas and allied fields, and (2) the Center for the Advancement of Service and Corporate Architecture and Design (CASCAD). Under the first one, the School will strengthen and expand her affiliation with the architectural profession as well as other allied professional and disciplines, including specific programs in strategic partnering, internship programs, curricular improvements, continued education, networking, publications, and symposia. Under the second initiative, the School will develop a new center that will serve as a clearing-house of information on service and corporate architecture by archiving, analyzing, and disseminating vital information on significant cases.

4. INTERDISCIPLINARY, INTERNATIONAL, INTERNSHIP

Increasingly, practice is conducted globally and with the participation of multiple client groups with multiple perspectives from multiple fields and disciplines. The greater the number of opportunities we provide our students to interact with others from other cultures and from other disciplines, the more effective we are in preparing their futures in architecture. It is the goal of the School to expand such opportunities abroad and within the CMU context.

As related to design education, the principal instrument for the expansion of the School's interdisciplinary and international and opportunities is project directed course work. Traditionally, such courses work well at CMU and tend to gain the attention of and therefore support by the central administration: e.g. the Solar Decathlon.

Consider a shift to a Master of Architecture degree, a required internship period would be an opportunity and vital experience for students, and one that would not add cost or time to the 5-year program currently offered. The program would be structured to maximize the exchange of knowledge between the academy and the profession.

1.0 Overview

1.1 _ Carnegie Mellon Quickfacts

HISTORY
Carnegie Technical Schools were founded in 1900 by Andrew Carnegie and became known as Carnegie Institute of Technology in 1912. In 1967, "Carnegie Tech" became Carnegie Mellon University after merging with the Mellon Institute.

COLLEGES

Carnegie Institute of Technology (College of Engineering)	**CIT**
College of Fine Arts	**CFA**
College of Humanities and Social Sciences	**H&SS**
H. John Heinz III School of Public Policy and Mgmt.	**Heinz**
Mellon College of Science	**MCS**
School of Computer Science	**SCS**
Tepper School of Business	**Tepper**

CARNEGIE MELLON LOCATIONS

Pittsburgh, PA	Silicon Valley, CA	Doha, QATAR
Athens, GREECE	Adelaide, AUSTRALIA	Kobe, JAPAN

ACCREDITED BY Middle States Association
DEGREES OFFERED Bachelors, Masters, Doctoral

ADMINISTRATION
Jared L. Cohon, President
Mark S. Kamlet, Provost
Mary J. Dively, Vice President and General Counsel
William F. Elliott, Vice President for Enrollment
Robbee B. Kosak, Vice President of University Advancement
Deborah J. Moon, Vice President and CFO
David S. Shapira, Chairman of the Board of Trustees

UNIVERSITY ENROLLMENT	Total	Female	Minority
Undergrad Enrollment	**5,580**	**2,174**	**606**
Part-time	97	43	7
Full-time	5,483	2,131	599
Masters Enrollment	**2,832**	**853**	**155**
Full-time	1,780	575	104
Part-time	1,052	278	51
PhD Enrollment	**1,619**	**471**	**37**
Full-time	1,494	427	34
Part-time	125	44	3
Special Enrollment	**89**	**33**	**3**
Full-time	1	0	0
Part-time	88	33	3
Total Enrollment	**10,120**	**3,531**	**801**

UNIVERSITY EMPLOYEES	Total	Female	Minority
Faculty	**1,459**	**423**	**66**
Tenure stream	609	135	31
Non-tenure stream	850	288	35
Full-time	639	200	28
Part-time	211	88	7
Staff	**3,172**	**1,630**	**237**
Full-time	2,892	1,485	218
Part-time	280	145	19
Total Employees	**4,631**	**2,053**	**303**

FRESHMAN CLASS

Number of Applications:	22,359		
Number of Admittances:	6,262	Admit Rate:	28%
Number Enrolled:	1,435	Yield:	23%
Average high school GPA:	3.64	Top 10% of HS class:	75%
Math SAT Average:	720	Verbal SAT Average:	660

STUDENT ENROLLMENT BY RACE

	Undergraduate	Graduate	Special
Non-Resident Alien/International	**752**	**1,872**	**28**
Male	466	1,331	17
Female	286	541	11
African American/Black	**297**	**102**	**1**
Male	161	57	0
Female	136	45	1
Asian/Pacific Islander	**1,332**	**389**	**6**
Male	772	265	4
Female	560	124	2
American Indian/Alaskan Native	**28**	**9**	**0**
Male	18	6	0
Female	10	3	0
Hispanic	**281**	**81**	**2**
Male	183	63	2
Female	98	18	0
White	**2,247**	**1,484**	**40**
Male	1,415	1,046	27
Female	832	438	13
Unknown/Other	**643**	**514**	**12**
Male	391	359	6
Female	252	155	6
University Total	**5,580**	**4,451**	**89**

COST OF ATTENDANCE
Academic Year 2007-2008

	Room	Board	Fees	Tuition
Undergraduate	**$5,663**	**$3,997**	**$594**	**$36,950**[1]
Graduate				
Carnegie Institute of Technology			**$394**	**$34,000**
College of Fine Arts			**$394**	**$30,900**
College of Humanities and Social Sciences			**$394**	**$32,200**
Heinz School of Public Policy and Management			**$394**	**$33,400**
Mellon College of Science			**$394**	**$33,300**
School of Computer Science			**$394**	**$33,300**
Tepper School of Business			**$394**	**$41,900**
Information Networking Institute[2]			**$394**	**$68,000**
Carnegie Mellon West[3]			**$150**	**$57,000**

[1] Tuition for Fall 2007 first-year students.
[2] Tuition for 16-month program.
[3] Full-time tuition covers three semesters.

COLLEGE OF FINE ARTS
Architecture, Art, Design, Drama, Music

	Total	Female	Minority
Undergrad Enrollment	**923**	**513**	**110**
Full-time	904	499	109
Part-time	19	14	1
Masters Enrollment	**204**	**100**	**7**
Full-time	186	91	7
Part-time	18	9	0
PhD Enrollment	**34**	**15**	**0**
Full-time	33	14	0
Part-time	1	1	0
Faculty	**248**	**101**	**19**
Tenure stream	85	33	8
Non-tenure stream	163	68	11
Full-time	48	20	6
Part-time	115	48	5

1.2 _ School of Architecture Snapshot

ADMINISTRATION

Carnegie Mellon University

President	Jared Cohen, PhD
Provost	Mark Kamlet, PhD

College of Fine Arts

Dean	Hilary Robinson, PhD
Associate Dean	Barbara Anderson (Drama)
Associate Dean of Research	Ramesh Krishnamurti, PhD (Arch.)
Associate Dean	Luis Rico-Gutierrez (Architecture)

School of Architecture

Head	Laura Lee, FAIA
Director, Graduate Program	Mark Gross, PhD

FACULTY

Tenured	11	(10.5 FTE)
Tenure Track / Full Time	3	(3 FTE)
Teaching Track	1	(.5 FTE)
Special Appointments	4	(3 FTE)
Adjunct	37	(10 FTE)
Joint Appointments	2	(0 FTE)
Courtesy Appointments	3	(0 FTE)
Emeriti	4	(0 FTE)

PhD	11
FAIA	2
AIA	26
RA	5
RLA	1
RIBA	2
P.Eng	3
LEED AP	8

STAFF

Administrative Staff	6	Technical Staff	3.5
Graduate Staff	1	Library Staff	1

PROGRAMS

Bachelor of Architecture	Coordinator(s)	# Students
First Year	Gerard Damiani / Doug Cooper	70
Second Year	Kai Gutschow	60
Third Year	Christine Mondor / Steve Lee	51
Fourth Year	Omer Akin / Khee Poh Lam	55
Fifth Year	Jonathan Kline / Gerard Damiani	38
		274

Master Programs	Track Chair	# Students
MS Architecture	Kee Poh Lam	1
MS Arch. Engineering Construction Mgmt.	Omer Akin	6
MS Building Performance and Diagnostics	Volker Hartkopf	0
MS Computational Design	Mark Gross	0
MS Sustainable Design	Stephen Lee	4
Master of Urban Design	Vivian Loftness	3
		14

PhD Programs	Track Chair	# Students
PhD Arch. Engineering Construction Mgmt.	Omer Akin	2
PhD Computational Design	Ramesh Krishnamurti	12
PhD Building Performance and Diagnostics	Volker Hartkopf	14
		28

OUTREACH

Outreach Programs	Coordinator	# Students
Architecture Explorations	Kelly Docter	605
Pre-College		57
Summer Institute for Diversity	Omer Akin	3
		665

CENTERS, INSTITUTES, LABS

Center for Building Performance and Diagnostics (CPBD)
Director — Volker Hartkopf, PhD

The Computational Design Lab (CoDe)
Director — Mark Gross, PhD

Digital Fabrication Lab
Director — Jeremy Ficca, AIA

Remaking Cities Institute (RCI)
Director — Luis Rico-Gutierrez

Sustainable Design Academy / Executive Education (SDA)
Director — Christine Mondor, AIA

Shop: Metal and Wood
Director — Scott Smith

FACILITIES

Space per Student

#Students	Square Footage	Square Foot per Student
320	50,108	156.6

Space Usage

Studios	17,650	35.2%
Conference / Crit	9,679	19.3%
Wood / Metal shop	4,231	8.4%
Faculty Offices	4,200	8.4%
Computer Labs	3,714	7.5%
Service	3,409	6.8%
Graduate Students	2,585	5.2%
Staff	2,306	4.6%
Digital Fabrication Lab	1,740	3.5%
Solar Decathlon House	594	1.2%
Total	**50,108**	**100%**

FINANCES

FY 2008 Base Allocation	$3,098,570
Base Allocation per Student (320 students)	$9,683

FY 2007 Total Income	$3,354,800	
FY 2007 Expenses		
Salaries / Benefits	$2,749,106	81.95%
Faculty and Student Support	$79,197	2.36%
Programs / Special Projects	$64,250	1.92%
Digital Fabrication Lab: Design, Equipment	$31,128	0.93%
Computers: Hardware / Software	$149,671	4.46%
Operating	$281,448	8.39%

2007 Endowment	$4,105,000
2007 Annual Awards to Faculty/Students	$338,050
2007 Research, Awards, Grants	$3,882,295
2007 Alumni Giving	$68,400

1.3 _ Rankings _ Carnegie Mellon University and the School of Architecture

Times Higher Education Supplement (THES) _ World University Rankings

35th	The World's Top 200 Universities	*Ranked October 2006*
14th	THES Domination Ranking by Prof. Henry Tulkens	*Ranked April 2007*
19th	North America's Top 50 Universities	*Ranked 2006*

U.S. News & World Report _ Undergraduate Rankings, 2007

22nd	Best University	*Ranked August 2007*

Chronicle of Higher Education

6th	Faculty Scholarly Productivity	*Ranked January 2007*

Kaplan / Newsweek _ 2007

	"Top 100 Global Universities"	*Ranked August 2006*
	"New Ivies"	*Ranked August 2006*

Design Intelligence _ Undergraduate Bachelor of Architecture Programs

10th	All Bachelor of Architecture Programs	*Ranked 2007*
3rd	Northeast Architecture Schools	*Ranked 2007*

CMU School of Architecture Student Survey

When evaluating the effectiveness of the School of Architecture in attracting and retaining students, we surveyed our Student Advisory Council elected members (in September 2007) and current students during the undergraduate I Scream social (in October 2007.) Responses from approximately 85 students were:

Why did you choose to attend Carnegie Mellon University?

#1 Carnegie Mellon University has an excellent academic reputation and overall ranking
#2 The interface between art and technology was an attractive option to students seeking an interdisciplinary approach to design
#3 The School of Architecture at Carnegie Mellon has an excellent reputation when compared to other institutions

What are the greatest assets / opportunities provided to students in the School of Architecture?

#1 Academic Reputation
#2 Educational Experience / Curriculum
#3 Community Atmosphere
#4 Faculty
#5 Study Abroad
#6 Professional Practice Internships
#7 City | Campus Context
#8 Facilities
#9 Design-Build Projects
#10 Extracurricular Activities

What do you enjoy most about the School of Architecture?

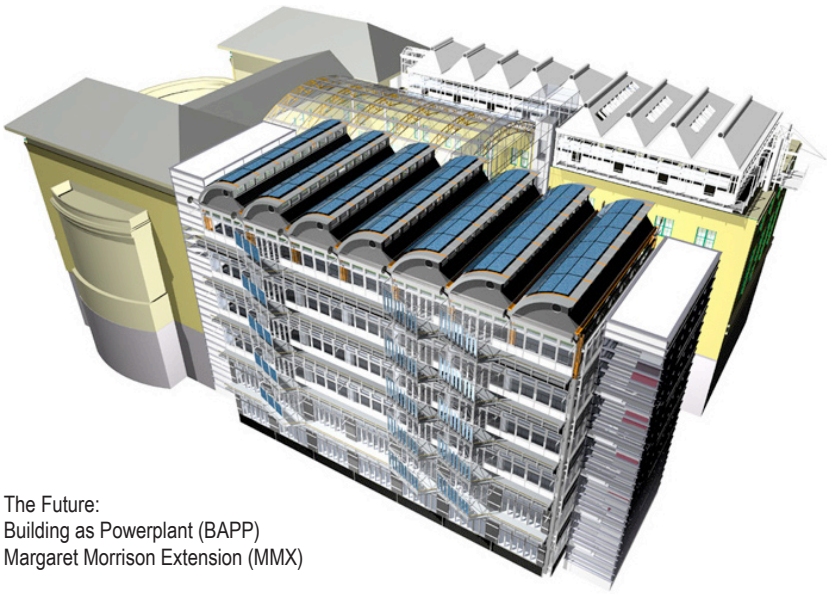
#1 Sense of community and studio atmosphere within the School of Architecture
#2 Faculty interaction, relationships, and knowledge of practical application of architecture
#3 The advancement of the School of Architecture and the forward-thinking of its faculty and students
#4 Challenging and thought-provoking academics
#5 Curriculum offerings and flexible opportunities

1.3 _ School of Architecture Buildings and Facilities

The College of Fine Arts

Margaret Morrison Carnegie Hall

The Intelligent Workplace



The Future:
Building as Powerplant (BAPP)
Margaret Morrison Extension (MMX)

2.0 Networks, Mission, Vision, Assessment, Progress

2.1_School of Architecture Network: Local, National, International

PROGRAMS

Local

Degree Programs Collaborators

University of Pittsburgh
Chatham University
Pittsburgh Glass Center
Pittsburgh Filmmakers

Art Institute of Pittsburgh
Carlow University
Duquesne University
Point Park
Robert Morris

Andy Warhol Museum
Carnegie Museum of Art
Childrens Museum
Heinz Architectural Center
Manchester Craftsman Guild
Mattress Factory
Phipps Conservatory
Pittsburgh Center for the Arts
Society for Contemporary Craft

AIA Pittsburgh
Carpenters Center
City of Pittsburgh Preservation Planning
Habitat for Humanity
IBACOS
Master Builders Association
Pittsburgh Builders Guild
Pittsburgh History & Landmarks Foundation
Preservation Pittsburgh

Internship/Job Fair
8 Local Firms

National

Internship/Job Fair
22 National Firms

International

Study Abroad
5 Exchange Agreements
33 International Exchange Programs

CENTERS, INSTITUTES, LABS

Local

Remaking Cities Institute
(Urban Lab 1990-2007)
18 Communities in Metro Pittsburgh
Community Design Center of Pittsburgh
Department of City Planning
Heinz Foundation Civic Design Coalition
Urban Redevelopment Authority

Sustainable Design
Green Building Alliance
River Life Task Force
Sustainable Pittsburgh

National

Remaking Cities Institute
Urban Land Institute

CoDe Lab
University of Colorado

Digital Fabrication Lab
AutoDesk

Sustainable Design
AIA Committee on the Environment
AIA 2030 Challenge
US Green Building Council
AOC; DOE; GSA; EPA; NAS; NIH; NSF

International

Digital Fabrication Lab
Materialize, Belgium

Remaking Cities Institute
Oxford University

Sustainable Design
Adelaide, Australia
Tsinghua University, China
World Business Council for Sustainable Development
United Nations Environmental Programme

OUTREACH

Local

K-12 Architecture Explorations
Batch Foundation
Carnegie Museum of Art
Grable Foundation
Hunt Foundation
McCune Foundation
McFeely Rogers Foundation
High Schools (50 students)
Middle Schools (50 students)
Elementary Schools (100 students)

Pre-College Program
5 Minority Students

National

Architecture Explorations
American Architecture Foundation
National Endowment for the Arts

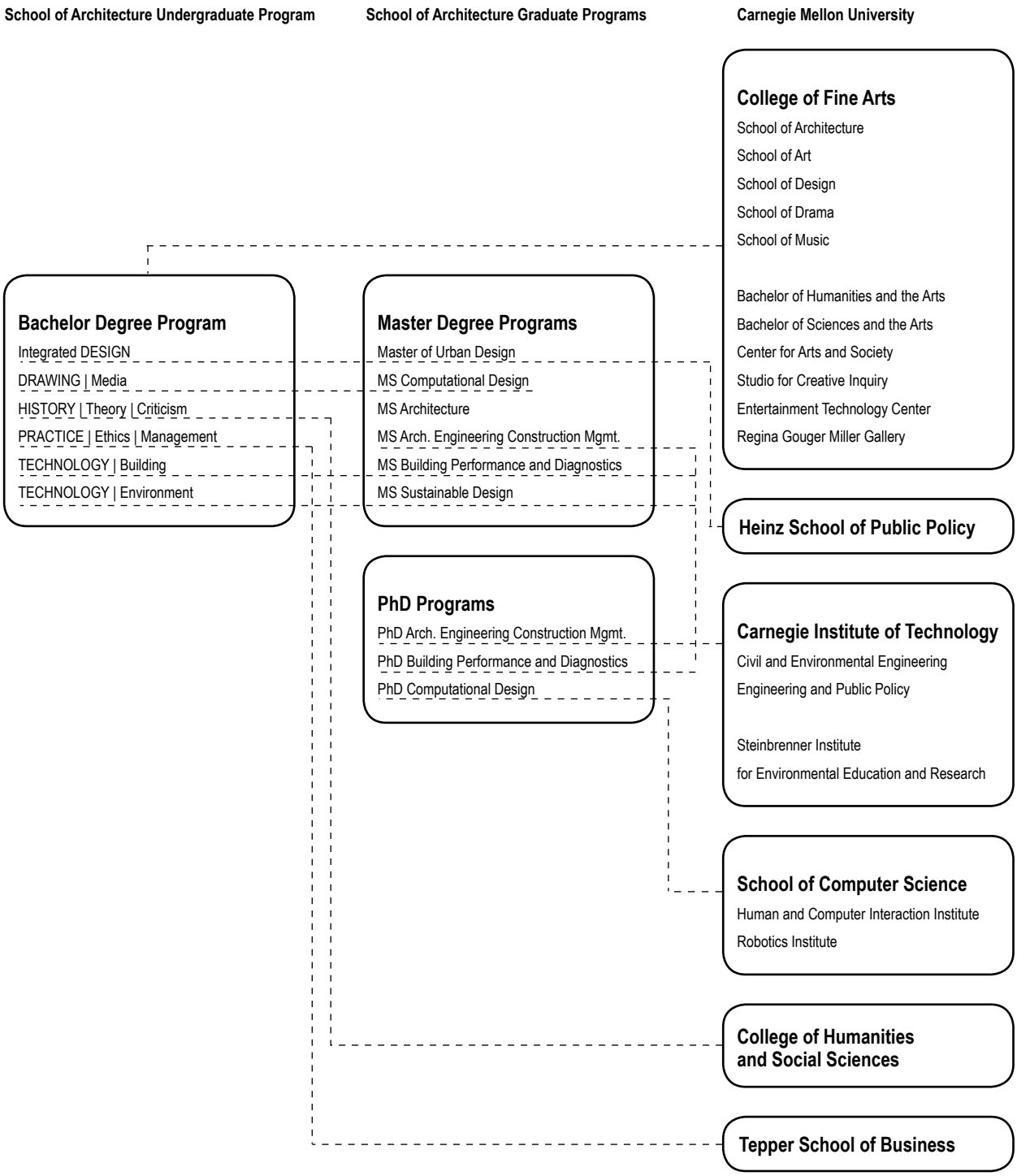
Pre-College
45 American Students

Summer Institute for Diversity (SID)
Howard University

International

Pre-College
5 International Students

2.2 _ School of Architecture Network at Carnegie Mellon



2.3 _ Mission and Vision

School of Architecture [SoA]

Mission
The mission of the School of Architecture is to educate future professional leaders with design creativity, global environmental consciousness, historical perspective, social responsibility, and technical competence.

To provide a balanced and integrated study of architectural practices, processes and systems
To prepare students for change through an intellectually challenging and disciplined exploration of architecture

Vision
To be recognized as a global leader of integrated design education, practice, research, scholarship and service.

Our Areas of Focus

Undergraduate Program

Design	**Integrated Design Education**
Drawing and Media	**Interdisciplinary Studies**
History	**International Exchange**
Professional Practice	**Internship Experience**
Building Technology	**Design Build Projects**
Environmental Technology	**Sustainable Practices**

Graduate Programs
- Advanced Building Performance and Diagnostics
- Architecture Engineering Construction Management
- Computational Design
- Sustainable Design
- Urban Design

Our Definition of Integrated Design <u>Education</u> and <u>Practice</u>
- To develop the capacity for analytical, critical and synthetic thinking within a given context
- To adopt a systems thinking approach to design, utilizing analog and digital tools (BIM)
- To apply research methods and technologies for collaborative decision-making
- To acquire disciplinary knowledge through case studies / case method
- To dialogue in trans-disciplinary and inter-cultural settings
- To engage and serve communities, toward sustainable futures
- To master the design-build process conceptually, methodologically, and technically

Our Approach: to Communication and Media in the Foundation Years 1, 2, 3

	Building (in the shop with wood, metals, other materials)
	Drafting (by hand)
	Drawing Freehand (including journals and sketchbooks)
Digital	Modeling
Physical	Modeling
	Reading
	Researching (including recording and reporting)
Public	Speaking
Critical	Thinking
	Writing

to Student Development and Knowledge Building

Leadership in the following knowledge realms:
- Environmental
- Economical
- Ethical
- Historical
- **Physical [DESIGN]**
- Philosophical
- Political
- Social
- Technical

Our Respect for Studio Culture : building a culture of optimism, respect, sharing, engagement, innovation.
- There is a world outside the design studio
- Collaboration is the art of design
- Design is the integration of many parts
- Design is inherently an interdisciplinary act
- Design process is as important as the product

College of Fine Arts [CFA]

Draft of New Mission

- To provide a challenging, encouraging environment where students and faculty maximize their artistic and intellectual potential through open critical inquiry and creative production
- To advance our pedagogical, research and service activities as a unique complement to the wider university community
- To be engaged with and informed by local contexts and communities and diverse cultures for mutual enrichment
- To influence professional practice and scholarship nationally and internationally

Draft of New Vision

- To be a leader of education in the arts at the highest level, a pioneer of research in and through the arts, an exemplar of excellence in professional practices, and a generator of cultural vitality.
- Through teaching, practice and research in our Schools of Architecture, Art, Design, Drama, Music and innovative interdisciplinary programs, the College will be an exemplar of creative achievement.
- Working at national and international levels, we will operate in partnership with local contexts and diverse cultures.
- We will continue to deepen pedagogical, research and service activities in tandem with the wider university community in order to ensure currency, efficiency and efficacy in implementation of this vision.

Schools	**School of Art**	**Programs**	Bachelor of the Humanities and the Arts Program	[BHA]
	School of Drama		Bachelor of the Sciences and the Arts Program	[BSA]
	School of Design		Entertainment Technology Center	[ETC]
	School of Music		Studio for Creative Inquiry	[SCI]
			Regina Gouger Miller Gallery	

Carnegie Mellon University [CMU]

Mission

To create and disseminate knowledge and art through research and artistic expression, teaching and learning; and to transfer intellectual products to society.

To serve our students by teaching them problem-solving, leadership and teamwork skills, and the value of a commitment to quality, ethical behavior, society and respect for one another.

To pursue the advantages provided by a diverse and relatively small university community, open to the exchange of ideas, where discovery, creativity, and personal and professional development can flourish.

Vision

Carnegie Mellon will be a leader among educational institutions by building on its traditions of innovation, problem solving and interdisciplinary collaboration to meet the changing needs of society.

This vision acknowledges that higher education will be challenged to meet the needs of society in the 21st century. Carnegie Mellon must be positioned to accept this challenge and responsibility so that we can continue to lead advances in educational and technological innovation, scientific discovery, creative expression and artistic production by fostering an atmosphere of intellectual excitement, innovation and entrepreneurship.

To exploit our comparative advantages and to identify opportunities for fruitful collaboration beyond our boundaries, we remain committed to interdisciplinary research and education, not only within and across academic fields, departments, schools and colleges, but also across institutional, national and cultural boundaries. We shall continue to focus our attention and resources where we can achieve excellence and comparative advantage in achieving our mission.

Strategic Goals

University Education
Information Science and Technology
Environmental Science and Technology
Biotechnology for Health and the Environment
Ensuring International Leadership
Fostering Diversity
Promoting Regional Strength

2.4 _ Assessment

In April **2004**, the School compiled the findings of 10 years of assessment from the following sources:

School of Architecture Student Survey 2002
School of Architecture Advisory Board Reports 2001, 1997, 1995
School of Architecture Design Faculty Retreat 2001
NAAB Visiting Team Reports 2000, 1995

The School of Architecture's general STRENGTHS are identified as:

Faculty: diversity, reputation in research, and impact of practicing faculty in teaching design
Students: intelligent and hard-working; many pursue minors and double majors
Academic, government and industry partnerships
Integrated design and media approach
Integration of education, practice, research, scholarship
Interdisciplinary collaboration in the college and university, nationally and internationally
Graduate research applied to undergraduate education; graduate research applied to practice
Graduate research in building performance, computational design, sustainability
Multi-cultural community: faculty and students with diverse backgrounds
Practice education / preparing students for the profession

Specific Strengths:

Program / Curriculum
- studio foci delivered each semester
- first year integration of shop, computer, drawing
- shop and design / build experience and impact
- practice education runs throughout curriculum
- students are prepared for practice
- minors and double majors

Faculty
- relationship between full-time and adjunct faculty
- cooperation between curricular streams
- excellent contribution of adjunct faculty

Technology
- expertise and research of grad faculty in computational design, building performance, sustainable design
- building systems and sustainability emphasis in undergrad program
- the Intelligent Workplace as a research laboratory

Research
- quantity and quality is nationally recognized

Student Surveys Pre-2004	School Strengths	studio foci structure and progression of program courses correspond to studio and each other well – rounded breadth of knowledge sequence of courses
	School Weaknesses	lack of design theory lack of thesis third year is too focused inflexibility in curriculum / rigid structure of required courses lack of non-architecture courses

Faculty Retreat August 2005
In preparation, nine questions were posed to all 56 faculty, with the following summary:

School's Mission?
1. integrated design approach
2. excellence and leadership in inventing the future of professional conduct
3. rigorous, balanced and integrated study; intellectual challenging education
4. systems, process, and practice approach to architecture education

School's Strengths?
1. faculty: dedication, diversity, experience; contributions of practicing adjuncts
2. College of Fine Arts / CMU context: the intersection between the design and technology
3. program structure and curriculum
4. students: curious, intelligent, hard-working

School's Weaknesses?
1. faculty balance: tenure to tenure track; full time to adjunct
2. fragmentation of focus; sum of the parts are not greater than the whole
3. demands of program on students
4. lack of freedom

School's Needs
1. increase design focus
2. increase external influence (visiting critics/faculty)
3. cohesion; set and maintain the highest standards
4. consistent visionary thinking

School's Strategic Advantages?
1. School's program connections: Bachelor of Architecture, Master of Science, PhD
2. interdisciplinary potential, specifically design and technology
3. Pittsburgh
4. CMU reputation

Challenges for the Profession?
1. declaring expertise in design
2. competency, leadership, quality
3. relevancy to society
4. public awareness of the value of architecture

Shared Values of Faculty?
1. commitment to design and interdisciplinarity
2. environmental sustainability
3. belief in the impact of architecture
4. collegiality and communication

Changes / Initiative
1. hire faculty committed to further the vision
2. program defined by additive knowledge through design sequence
3. set high standards for communication of student and faculty work
4. interdisciplinary projects

Open Comments
1. informal situation / social events lead to rewarding exchanges
2. School culture: embrace strong points of view
3. focus on process orientation
4. maintain balance between theory and practice

Student Forum February 2005
Held at the monthly I Scream Social questions to students were posed with the following responses:

Q: Did the School meet your expectations?
Yes: _challenged in ways didn't students didn't think about
_architecture student culture / family atmosphere is very strong
No: _hoped for a more balanced college experience

Q: What is our image? _good regional reputation
_strong overall school rankings
Concerns: _relationship between school/city/people
_School of Architecture gets over-shadowed by other departments

Q: What should be our image? _art and technology relationship – play it up
_freedom; we don't have a "this is the way architecture has to be" mentality
_sustainability
Concerns: _ need more publicity: events and projects that get exposure

Q: Missed opportunities? _graduate and undergraduate link
_technical minis
Curriculum Concerns: _more history of art/culture
_relation of required to needed knowledge base
_broad based "how do you design for a world your not living in?"
_restrictive curriculum doesn't allow room to exchange sequence of courses

---

Results of the National Architectural Accreditation Board 2005 Review

Conditions Well Met

1.5 Architecture Education and Society (at CMU = on site studies, quality of research, sustainability, pre-college, urban lab)

Student Performance Criteria Well Met

12.6	Collaborative Skills *Ability*	(graduates will transition easily into practice)
12.7	Human Behavior *Understanding*	(breadth of awareness of users, in-depth reports)
12.15	Site Conditions *Ability*	(ecology and environment)
12.37	Ethics and Professional Judgment *Understanding*	(case studies)

Visiting Team General Comments

Faculty - committed and productive
Students - energetic and intelligent
Commend: collaborative learning
Commend: community involvement
Commend: studios express real world commitment
Commend: mission of integrated design in first two years
Comment: professionalism of School and preparing students for practice
Comment: exceptional quality of courses - cited as exciting and rigorous
Could benefit from: greater liberal arts education, experimentation with other materials
Cause for concern: graphic skills in upper level studios
Cause for concern: diversity in the School of Architecture and campus wide

Conditions Not Met

5.0 Human Resources	overly dependent on adjunct faculty
	senior faculty role in undergraduate required courses, application of research to teaching
	need for leadership in design (weak design aesthetic / integration in 4th and 5th year)
7.0 Physical Resources	wood shop too small, equipment out-dated, no spray booth
	lack of equipment to work with materials other than wood
	lack of 3-d digital equipment / milling machine
	consolidate studios into one building!?

11.00 Professional Degree and Curriculum (60/40 split not respected)

Student Performance Criteria Not Met

12.14 Accessibility	
12.29 Comprehensive Design	(need to retain knowledge from years 1-3 in years 4 and 5)

School of Architecture <u>NEEDS</u> Identified from the 2004 Assessment

Undergraduate Curriculum

efficiency: overlap and gaps exist, some do not respect credit hours
vertical connections between years, building on previous knowledge, it should be additive
design creativity, innovation, experimentation
social responsibility emphasis in all years
connection to arts / humanities
to engage other stakeholders in the studio (clients, consultants, community, etc.)
more frequent, passionate, high caliber visitors
more design / build
thesis

Diversity need to increase diversity in student admissions and faculty hiring

Facilities

inadequate computer resources and support for curricular demands and CMU reputation
plotters, CNC milling machines, rapid prototyping, 3d printers, laser cutter, and support
hands-on lab for studying building science, structures, environmental systems, construction
space and new equipment for materials / woodshop
media / reproduction center

Faculty

revised system for faculty loading
full-time to part-time ratios are stretched
mentoring and professional development
full-time faculty are overextended, no time for mentoring
overload on junior faculty to carry undergraduate curriculum
researchers have advantage over artists, scholars, and practitioners
lack of performance evaluations making it difficult for adjuncts to advance
lack of assessment program for full time faculty for merit increases / raises / advancement
adjunct feel adjunct, needed to have impact on decisions
spokesperson for adjunct faculty
sabbaticals / supported leaves

Financial / Funding

endowed chairs
to take advantage of alumni base
increase the school budget, at least to a fair level
increased and dedicated funding for highest quality speakers
to secure more industry and practice sponsorships

School of Architecture <u>DIRECTION</u> as a Response to the 2004 Assessment

General

Identity	advance a shared vision and a unified message
Visibility	increase public relations and multi-media publications
Administration	provide staff structure and support; increase communication
Strategic plan	revise plan and create time-line for execution
Fund-raising	dedicate administrative, faculty, and staff effort
Faculty	recruit and hire junior design focused faculty
Students	provide entry scholarships for competitive advantage
Alumni	establish database, programming of events; increase communication
Community	expand outreach and service (university, community, professional)
Facilities	provide space and equipment in support of integrated design focus
Networks	increase academic, government, industry, and practice partnerships
Resources	provide state of the art technology in teaching, scholarship, research

Curricular Development

Ensure	horizontal / vertical connections	to fully achieve integrated design
Develop	assessment / measures	for cumulative learning through studio sequence
Increase	internship program	through engagement with professional practices
Increase	international experience	through study abroad and faculty exchange programs
Increase	interdisciplinary focus	through on-campus and community connections
Increase	lecture series and visiting critic program	
Introduce	faculty colloquia and workshops	
Advance	minors / double majors tracks	
Facilitate	5 plus 1 degree sequences	
Consider	Master of Architecture degree	

2.5 _ Progress Since 10 Year Assessment and the 2005 National Architectural Accreditation Visit

PROGRESS in the Bachelor of Architecture UNDERGRADUATE Program

Embarking on a plan toward an integrated design education, the undergraduate program and curriculum have experienced dramatic changes in the past three years. Within the curriculum, we are working to ensure horizontal and vertical connections to fully achieve integrated design. And we are more carefully developing assessments to measure cumulative learning throughout the studio sequence. The reduction of required courses has opened the possibility for 7 architecture electives and 7 university electives, thus promoting a greater liberal arts education, increasing possibilities for minors and double majors, and advancing interdisciplinary study. Approximately 75% of our students study and travel abroad during their five years in the program. Introduction of a thesis studio in the spring of 2008 intends to recognize student's individual aspiration for future careers.

2004 fall Granting of studio funds per year / per semester for **student travel experience** and **visiting critics program**
2004 fall New Studio Review Format: all faculty in all years attend all reviews along with local and national guest critics
2004 fall Monthly meetings of studio coordinators discuss knowledge exchange across years and across curriculum
2005 spring Introduction of Real Estate Design and Development in collaboration with Heinz and Tepper Business School
2005 spring New Lecture Series with involvement in studio reviews every Monday. Series includes one alum, one faculty
2005 fall Requirement for each student, each semester to produce portfolio quality studio documentation for exhibit
2005 fall Shift in software use from limited palette to: Maya, Rhino, 3d Studio max and now Sketch-up and Revit
2005 spring Coordinator roles of faculty for each year program established as equivalent to one course loading
2005 spring Introduction of in-house sponsored competitions: Epic Metals, NCMA, Velux Corporation
2006 fall Integration of third year studio with Site engineering and Environmental Systems
2007 spring Integration of fourth year studio and Advanced Building Systems
2007 fall Introduce new admissions process including essay, interview, portfolio (optional)
2007 fall Move to vertical studio selection process in fourth and fifth year programs
2007 fall Re-conceive first, second, third year programs as foundation
2007 fall Faculty student ratios in studios average 11:1
2008 spring Introduction of Thesis program
2009 Master of Architecture?

Curriculum
Changes in the curriculum have been made to emphasize design creativity, innovation and experimentation. Frequent distinguished guest critics are a regular part of the program along with a new dedicated high-profile lecture series. Design build projects -- analog and digital -- have become more prevalent throughout the curriculum. Social responsibility is entering the discussion in all years although we still need to engage other stakeholders in the studio (clients, consultants, community, etc.)

Calculus for Architecture	replaced Differential and Integral Calculus
Physics for Architecture	replaced Physics for Engineers
Critical Histories of the Arts	replaced World History
Principles of Economics	removed as required
Statistical Reasoning	removed as required
Site Engineering	reduced from 9 to 6 units
Advanced Building Systems	reduced from 9 to 6 units
Acoustics and Lighting	reduced from 9 to 6 units
University Electives	increase by two courses (18 units)
School Electives	increase by three courses (27 units)

Admissions
Revision of the admissions process in 2006 to include a required questionnaire, as well as optional interview and portfolio has been a major undertaking for the School. Our intention in this process is to assess students' preparedness for architecture education and for the rigor of Carnegie Mellon. The mechanics of the process and results are described in more detail later in the main report. While the new process promises better students and greater retention, it has placed new demands on the faculty and required 50% of a full time staff person. As we are now embarking on recruiting trips, the financial toll of this process has placed significant pressure on an already stretched operating budget.

New Electives

2004/05	Arcadia in Context: An Interdisciplinary Course	Diane Shaw
	Asian Architecture	Mrea Csorba
	Contemporary London Architecture	Raymund Ryan
	History of Sustainable Architecture	Christine Mondor / Charles Rosenblum
	Inventing Futures with Design Computing	Ellen Do
2005/06	Architectural Lighting Design (with the School of Drama)	Cindy Limauro
	Architectural Construction Kits / Architectural Robotics	Mark Gross
	Competitions as Independent Study	various design faculty
	Design Computing Theory and Methods	Mark Gross
	Mapping Urbanism	Kelly Hutzell
	Model Making In Wood: Barns Exhibit at CMoA	Scott Smith
	Parametric Design: Maya / Rhino / Rapid Prototyping	David Burns
	Passport (see http://www.arc.cmu.edu/passport)	Dee Briggs / Jay Ball
	Portfolios Presentations Publications	Kelly Hutzell
	Real Estate Design and Development	Casimer Kawecki
2006/07	Architectural Robotics	Mark Gross
	Contemporary Middle Eastern Cities	Rami el Samahy
	Critical Histories of the Arts	Ting Chang
	Destruction and Rebuilding of Iconic Buildings and Cities	Joseph Coohill
	Digital Fabrication: How to Make Things	Mark Gross
	Ecological Footprints	Volker Hartkopf
	Patterning: Third Generation Digital Design	David Burns
	Synergistic Form (joint with the School of Art)	Charles Rosenblum
2007/08	European Cities in the XIX Century: Planning, Arch, Pres	Francesca Torello
	Drawing Elective: Clearly Complex and Sublimely Simple	Kent Suhrbier
	Advanced CAD, BIM, and 3D Visualization	Kristen Kurland
	Digital Fabrication Lab Construction	Jeremy Ficca
	Making Furniture Interactive	Mark Gross
	Contemporary Architectural Theory	Charles Rosenblum

PROGRESS in the Masters and PhD GRADUATE Programs

New Degrees and Programs

2003 Master of Science in Sustainable Design
2004 Master of Science in Architecture, Engineering and Construction Management
(joint with Department of Civil and Environmental Engineering)
2004 Master of Urban Design
(collaborative with the Heinz School of Public Policy and Oxford University, UK)
2007 PhD Architecture Engineering Construction Management
(joint with Department of Civil and Environmental Engineering)

General Advancements

Introduce travel fund and application process for graduate students to attend conferences / workshops. $3500 annually
Increased enrollment in 2006 and 2007 by 22% over previous years resulting in balanced budget for the program
Introduce transparency of finances for graduate program and faculty responsibilities
Increase stipends for graduate students and structure
Revision of Master and PhD handbooks

PROGRESS in FACULTY Support and Recruitment

New Support for Faculty

2004 Yearly grants for professional development established for all full time faculty $1500 each (now $1850 per year)
2004 Yearly grants for professional development established for all adjunct faculty $20 per teaching unit (now $25 per unit)
2004 Yearly grants for student development established for 18 design studios @ $2000 each (now $2750)
2004 Standards for providing increased Teaching Assistants and lab monitors, with clear policies and compensation rates
2005 Travel allowance for faculty to accompany students on field trips @ $600 per faculty member for 3 days excursions
2007 Reduction of faculty load from 4 to 3 courses recognizing PhD advising, administration, research and service
2007 Increase in adjunct faculty compensation at average 22%
2008 Introduction of Sabbatical Program with internal funding

Retirements and Hire

Three full-time faculty retired	2002	Delbert Highland, Professor	
	2003	Ulrich Flemming, Professor	
	2005	David Lewis, Teaching Professor of Urban Design	
Two faculty appointed	2001	Doug Cooper appointed The Andrew Mellon Chair	
	2003	Vivian Loftness, FAIA appointed University Professor	
Two faculty received tenure	2003	Laura Lee, FAIA	
	2005	Diane Shaw, PhD	
Two tenured faculty hired	2003	Khee Poh Lam, PhD, RIBA	Professor with tenure
	2004	Mark Gross, PhD	Professor with tenure

Faculty searches in the past three years have resulted in the following tenure track design faculty hires with design emphasis:

2004 / 05	Kelly Hutzell	MArch Columbia	Caste Assistant Professor
2005 / 06	Jeremy Ficca	MArch Harvard	Assistant Professor
2006 / 07	Pablo Garcia	MArch Princeton	Assistant Professor

Kelly **Hutzell** leads the 5th year Urban Design studio and faculty team of 3
Jeremy **Ficca** leads the 2nd year Materials and Assembly studio and faculty team of 5
Pablo **Garcia** leads the 1st year Form and Space studios and faculty team of 7

Faculty searches in pursuit of **leadership in design** will be conducted in the coming years as follows:

2007 / 08	Caste Visiting Assistant Professor in Architecture and Urban Design
	Fitzgibbon Visiting Professor
	2 Visiting Faculty
	2 Tenure-track Faculty
2008 / 09	2 Tenure-track Faculty
2009 / 10	2 Tenure-track Faculty

The School benefits from the following **joint** appointments

Irving Oppenheim, PhD	Professor of Civil Engineering	teaching structures
Susan Finger, PhD	Assoc. Prof. of Mechanical Engineering	teaching arch engineering construction
Kristen Kurland	Assoc. Teaching Prof, Heinz School Public Policy	teaching BIM and GIS

The School benefits from the following **courtesy** appointments or joint course faculty

Omer Akin (arch)	Department of Civil and Environmental Engineering	
Mark Gross (arch)	Human Computer Interaction Institute	
Diane Shaw (arch)	Department of History	
Larry Cartwright	Civil Engineering	teaching Design Build
Cindy Limauro	Professor of Drama	teaching Architectural Lighting Design
Robert Reid, PhD	Dept. of Mechanical Engineering	teaching Physics for Architecture
Raymund Ryan	Carnegie Museum, Heinz Arch Center	collaborating on Lectures and Exhibitions

To support advancement of the School with respect to the strategic initiatives, the School is partnering with University Advancement to fund-raising for three senior endowed chairs as follows

Professor of Practice	$2,500,000 *endowment*
Professor of Sustainable Design	$2,500,000 *endowment*
(David Lewis) Professor of Urban Design	$2,500,000 *endowment*

New Adjunct Faculty

2004	Dee Briggs	MArch Yale	First Year Studio
	Teresa Bucco	MArch North Carolina	First Year Studio
	David Burns	MArch Columbia	First Year Studio, Introduction to Digital Media
	Mrea Csorba	PhD U. Pittsburgh	Asian Architecture
	Matt Fineout	MArch Sci-Arc	Fourth Year Studio
	Abigail Hart Gray	MArch Columbia	webFolios
	Mark Gross	PhD MIT	Computational Design
	Rebecca Henn	BArch CMU	Professional Practice
	Casimer Kawecki	MArch Virginia	Design Economics
	Jeff King	MArch Tulane	Fourth Year Studio
	Cindy Limauro	Professor of Drama	Lighting Design
	Jen Lucchino	MArch Rice	First Year Studio
	Robert Reid	PhD Carnegie Mellon	Physics for Architecture
	Raymund Ryan	MArch Yale	Contemporary London Architecture
2005	Greg Galford	Architectural Association	Second Year Studio
	Anne-Marie Lubenau	BArch Carnegie Mellon	Fifth Year Urban Lab Studio
	Jason Morris	MArch Illinois Inst. Tech.	First Year Studio
	Jim Taylor	MArch Rensellaer	Third Year Studio
2006	Joseph Coohill, PhD	PhD Oxford	Architectural History
	Rami el Samahy	MArch Harvard	Fifth Year Urban Lab Studio
	Mike Gwin, AIA	BArch Virginia Tech	Third Year Studio
	Don Johnson, RA	MArch Yale	First Year Studio
	Mick McNutt, AIA	MArch Syracuse	Fourth Year Studio
	Matt Plecity, RLA	MArch University of Virginia	Third Year Studio
2007	MaryLou Arscott, RIBA	AA London	First and Second Year Studios
	Christine Brill, RLA	MLA Penn State	Third Year Studio
	Jonathan Golli, PEng	MArch Toronto	Second Year Studio
	Francesca Torello, PhD	PhD Politecnico Torino	Architectural History
	Mark Minnerly, RA	BArch Cornell	Real Estate Development

Elevating long term and award winning adjunct faculty to leadership positions in design, practice, research

Ten of 38 adjunct faculty have over ten years of sustained commitment to the design studio program in the School. All are award winning practicing principals. These faculty have provided leadership in design and have provided mentoring of junior adjunct faculty. Most recently, a new category of faculty has been created, a practice track, with a three-quarter time appointment. Gerard Damiani, is the first to hold the title of Professor of Practice and will be leading the introduction of a thesis program in the final semester of the program. Similarly, Luis Rico, Associate Dean, has been granted a three year, three quarter time appointment which allows him to teach as well as direct the Remaking Cities Institute. A third faculty member, Christine Mondor, holds a three quarter time appointment and leads the new Sustainable Design Academy, Executive Education Program

Re-engaging tenured faculty in undergraduate design studios

The following senior faculty have resumed coordinating and teaching in the undergraduate studios:

Omer Akin – coordinator	Fourth year Occupancy studios
Doug Cooper – coordinator	First year Spring Semester
Volker Hartkopf	Fourth year Systems Integration studio lectures on Systems Integration
Khee Poh Lam – coordinator	Fourth year Systems Integration studios
Vivian Loftness	Third Year and Fourth Year studios

[Note: Steve Lee remains as the coordinator of the Third year Advanced Construction studio}

PROGRESS in Administration and Staff

To accommodate an expanded mission and to accomplish substantial change and growth, the School reconceived the administrative staff in its entirety. Several new staff were hired under new titles, with revised job descriptions, and increased responsibilities. Undertakings such as the new admissions process, or the construction of the digital fabrication lab would not be possible without a directed recruitment and hiring effort supported by the University.

NEW staff positions and hires include:

Dave Koltas	Business Manager
Heather Workinger	Senior Academic Advisor
Kristen Frambes	Senior Administrative Associate
Alexis McCune	Coordinator of Student Programs
Amy Bickerton	Office Assistant and Webmaster

The most important and needed staff hire is a Computing Manager, capable of strategic planning and overseeing the new digital fabrication lab. The market rate for such an IT staff will stretch the School's budget, although this is an absolutely needed hire.

PROGRESS in FINANCE and FUNDRAISING

1. The School maintains a balanced budget each year. In fact, the School contributed $50,000 to the College debt in 2006
2. The School restructured the budget to ensure equity in support of special programs, travel, scholarships, and faculty / students
3. The School negotiated with the University to share profit of the Pre-College program with average annual income of $40,000 (the School raised enrollment in the program from 9 in 2004 to 56 in 2007)
4. Alumni giving has increased from $35,000 in 2004 to $63,000 in 2007 through a restructured annual appeal process
5. Endowment *related to* the School has increased from $1.8 million in 2004 to $4.1 million at present
6. Annual awards to faculty and students have increased from $100,000 in 2004 to $335,000 in 2007
7. The School (Steve Lee) has raised funds to support three Solar Decathlon projects averaging $400,000 in 2002, 2005, 2007
8. The School reached $3,867,000 in research, awards, and grants in 2006
9. In kind donations have totaled over $750,000 in the past three years
10. The School has balance the budget of the Center for Building Performance since July 2005

PROGRESS in FACILITIES and EQUIPMENT

2004	
Renovation of main administrative offices College of Fine Arts #201	$ 25,000 + $75,000 in kind donation
Renovation of MMCH 409 into Master of Sustainable Design Studio	$ 35,000
Renovation of MMCH 408 into CoDe Lab	$ 5,000
2005	
Renovation of main design studio CFA 200 and addition of 34 movable crit panels	$ 60,000
Renovation of CFA 214 into new computer lab, crit / exhibition / lecture space	$ 80,000
Renovation of MMCH 102 into Master of Urban Design studio and community lab	$ 40,000 in kind donation Mosites
Shop expansion of 900 square feet	
2006	
Renovation of MMCH 308 into computer lab for first, second, third year students	$ 30,000
Renovation of MMCH 310 first year yellow studio for additional crit space	$ 15,000
Creation of an exclusive metals shop as part of the architecture woodshop in CFA	$ 10,000
2007	
Renovation of MMCH 410 main space and faculty offices and conference room	$ 40,000
Creation of adjunct faculty office suite	$ 2,000
Creation of digital fabrication lab	$500,000 from Provost

Computing: increase in number and distribution of high-powered graphic, dual screen work stations and software

The School has invested in new computers and state-of-the-art software as follows

2004/05	24 existing machines	24 for 260 students	1:11 ratio
2005/06	28 additional machines	52 for 260 students	1: 5 ratio
2006/07	24 additional machines	76 for 260 students	1: 3.5 ratio

Digital Fabrication: Creation of New Lab in Margaret Morrison

A new 1750 square foot facility has been established for the School of Architecture with direct support of the **Provost**, Mark Kamlet. Construction cost for the facility is approximately $500,000. The fabrication lab is centered on five pieces of complementary equipment plus a $70,000 spray booth facility. These can be categorized as two-dimensional and three-dimensional additive and subtractive processes. The equipment and associated costs borne by the School of Architecture are as follows:

CNT Motion 950 CNC Router 48" x 96" x 11" including workstation	$48,000
Epilog Legend 36EXT Laser Cutter 24" x 36" including workstation	$32,000
Dimension 768 SST 3d printer (abs plastic) 8" x 8 "x 12" incl. workstation	$28,000
Z-Corp Z450 3d printer (plaster) – 8" x 8" x 10" incl. workstation	$40,000
Formech MB660 Vacuum Forming Machine 24" x 48"	$10,000
Purex HEPA, Chemical and Dust Filtration System for laser cutter	$ 6,500
GFS Industrial Spray booth	$12,000
Oneida Cyclone HEPA dust collection system	$ 1,500
Compressed Air System including dryers and filters	$ 2,000
Total Cost	**$180,000**

Improvements in the Existing Shop Facilities

With direct financial support from the **Dean**, Hilary Robinson, the woodshop has expanded its space by 900 square feet, upgraded existing and purchased new machinery, and expanded its material capabilities beyond wood. A metals shop has been added. The total investment = **$42,356.21**

PROGRESS in Alumni Relations

Receptions

2004/5		
Boston	46 attended in November 04	hosted by Elliott Rothman, Rothman Partners
New York	94 attended in February 05	hosted by Adam Farmerie | Greg Bradshaw @ Public
Pittsburgh	30 attended in April 05	in conjunction with Spring Carnival
2005/6		
Chicago	36 attended in May 05	hosted and sponsored by the Al-Chalabi's
San Francisco	32 attended in May 05	hosted by Dan Garber
Las Vegas	40 attended in June 05	in conjunction with the AIA convention
New York	90 attended in March 06	hosted and sponsored by Adam Farmerie | Greg Bradshaw @ Public
Pittsburgh	30 attended in April 06	in conjunction with Spring Carnival
2006/7		
Los Angeles	50 attended in June 06	in conjunction with the AIA convention
Boston	28 attended in March 07	hosted by D.Madson / A. LeBuffe CBT Architects
Pittsburgh	30 attended in April 07	in conjunction with Spring Carnival
San Antonio	47 attended in May 07	in conjunction with the AIA convention
Washington, DC	32 attended in October 07	in conjunction with the Solar Decathlon

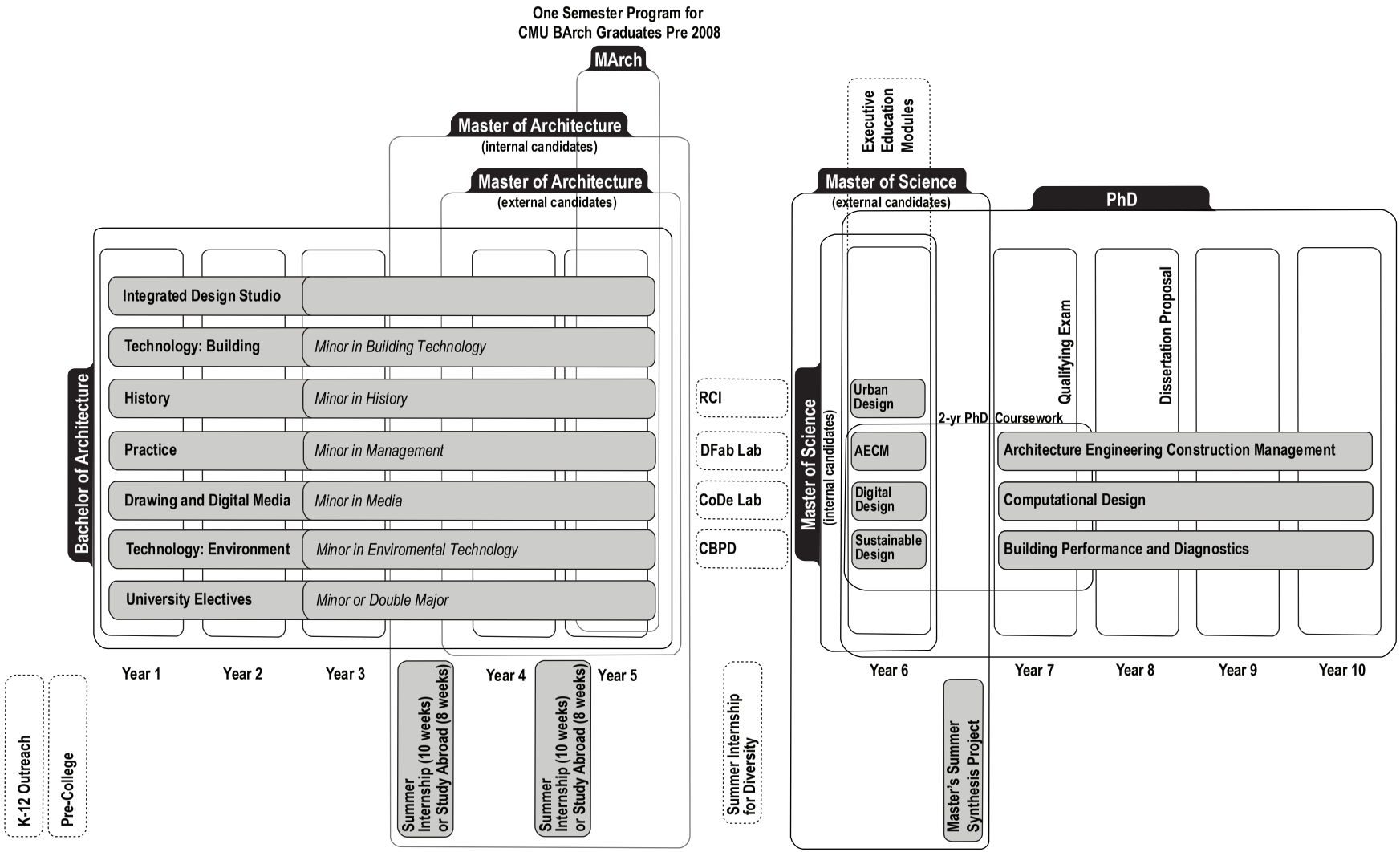
Alumni Annual Appeal and Newsletter

Beginning in 2005, the School prepares a 2-page news summary of the news and accomplishments of the School of Architecture community. We make direct appeal for projects that directly impact and enhance the students' academic experience. The result has been an increase of annual giving as follows:

2004	$40,000
2005	$54,000
2006	$58,000
2007	$64,000

3.0 Strategic Initiatives

3.1 _ School of Architecture Programs



3.2 _ Strategic Considerations _ Integrated Design, Practice, Research

Purpose:
Models of "Integrated Design" are flourishing in practice, but the transfer of these ideas to the academy remains a vital project. At the Carnegie Mellon School of Architecture, we are committed to a carefully differentiated, and multi-pronged approach towards this goal through education, practice and research.

Program:
The foundation years of the professional undergraduate program (years 1-3) are based on a concept of "Integrated Design Knowledge and Media." Students begin by mastering and integrating a wide range of 2D and 3D media and tools, both digital and analog, as a means to explore and communicate fundamental principles and ideas of architecture and the built environment. Gradually, they are asked to integrate into their studio work additional knowledge bases and alternate ways of investigating architecture that are introduced in closely integrated lecture and lab courses. In the upper years of the undergraduate program (years 4-5), students are increasingly exposed to more technical and affiliated fields, including landscape, advanced structures, programming and occupancy, urbanism, and the complete spectrum of technical systems involved in complex buildings. In each case students are asked to integrate previous knowledge bases with new ones, and opportunities for feedback from, and collaboration with, outside experts based on the methods of "Integrated Practice" is an integral part of the studio learning. The latest research and thinking in sustainability, building performance, and urban design are introduced through faculty from the graduate and research programs, while study abroad, community involvement, site-based, and hands-on learning opportunities allow each student to begin to chart their own interests and fields of expertise. Use of the new state-of-the-art digital fabrication lab (DFabLab) will be integrated throughout the curriculum in order to expose students to this increasingly important technology, but more importantly to understand the "Integrated Design" principles that occur when "Design" and "Fabrication" are unified. A year-long thesis studio that will encourage advisorship and collaboration with a wide-range of practitioners and experts, will serve both a capstone project and a way to inspire our students to become innovators and leaders in practice. Such a comprehensive design experience allows the student to synthesize what they have learned and to ask, research, and propose innovative solutions for fundamental questions that will help launch their careers as "Citizen-Architects of the Future."

The School's highly-regarded research efforts and affiliated Master's and PhD programs in the areas of Sustainability, Building Performance, and Computing, will continue to expand their leadership and commitment to engage practice, the construction industry, and related expertise. A program of executive education in sustainability will provide a forum for the SoA to disseminate its research agendas and best practices to practitioners on a local, national, and international level, and help bring professionals from all aspects of the building project to CMU to introduce the latest trends in practice, and for possible collaboration with faculty research or student design projects. The Remaking Cities Institute, with its emphasis on education, regional impact, and research, provides a unique opportunity to reach out to local communities, and to integrate policy, economic, and community-related professionals and ideas into the School.

Further opportunities for strategic partnering between practice and academia are sought for "Funded Studios" and other "real-project" learning opportunities of all kinds, from endowed competitions, to "corporate" projects, to community-based interventions. The DFablab, for example, is poised to serve as a "design center" for "real" design projects on the CMU campus to allow students and faculty access to projects and funds that can deliver real products. Further integration of practice and academy will come through an "Enlightened Internship" program through which students can be encouraged to gain real-world experience in "Integrated Practice," but also to disseminate some of the expertise and knowledge already gained at CMU. All such real-world projects offer resources and fertile ground to link research and teaching with real funding opportunities.

People:
Delivering education and research on "Integrated Design & Practice," and breaking the boundaries between practice and academy requires us to expand the core group of design-focused, full-time tenured and tenure-track faculty with extensive experience in practice, especially related to "integrated-design" practices. The SoA recognizes that at present much of the expertise and experience in the "Integrated Practice," and technologies such as "Building Information Modeling" (BIM) resides in practitioners, especially those in large corporate firms and complex building projects. It is committed to finding innovative opportunities to engage these professionals both on short-term and long-term basis, at both the undergraduate and graduate levels. In order to allow true, full-time practitioners to have a greater impact on the school, the SoA should create and empower more "Hybrid" positions within the school that allow both full-time practice, and rich teaching opportunities, as well as engage more "Visiting Professorships." This is especially important for the curriculum focused on the complexities of big buildings and their inter-connected systems and specifications. In addition, the SoA must work to expand collaboration with faculty and students throughout the CFA, as well as the wider university, and in partnering with neighboring and global institutions in all areas of engineering and policy. In support of continued innovation and experimentation, the SoA must expand the ability and support for core design-studio faculty to take on special projects, research interests, and collaborative ventures through sabbaticals and release from teaching responsibilities, even without the usual "buy-out" funding.

Place:
The design studio must remain the heart and central focus of the School, both in a physical and intellectual sense. Although much of the world is going digital, and research and communication can increasingly be done remotely and collaboratively on a global scale through a "distributed node" model, delivering an education that prepares the architect of the future for an integrated model of architecture requires a commitment to creating and maintaining innovative "bricks-and-mortar" design studios and flexible spaces to promote collaboration. CMU is committed to defining and exploring ways to implement the "Studio of Future," where computing and communication is ubiquitous to allow collaboration, research, information management, fabrication, and communication of ideas to take place fluidly. The "de-clustering" of computers, the integration of the DFabLab into the curriculum, and a commitment to purchase and integrate into the curriculum further high-end input and output devices, are first steps in the process.

Additional steps will involve re-structuring the studio, research, and collaboration spaces themselves, providing larger spaces, as well as smaller, flexible, and even mobile spaces that might take on any of a number of different uses including meeting spaces, pin-up and presentation opportunities, model-making rooms, or temporary research labs.

Long-term innovation will require greater resources to fundamentally restructure the teaching and research spaces currently used by the SoA. The distributed and fragmented network of spaces currently in use must be more closely unified to allow true and more elaborate collaboration and integrated design experiences to occur. In this vein, the DFabLab should be expanded to allow for increased use by students of all levels, and to expand the possibilities of engaging both research and design projects. The BAPP/MMX envisions just such a restructuring of spaces, creating a network of workshops to facilitate innovation and collaboration among many departments of the university, of the College of Fine Arts, as well as within our own school. The primary "competitor" schools to the SoA at CMU (Cornell, Ohio State, Syracuse) have all recognized the need to create new and uniquely productive environments for architectural research, learning, and collaboration by constructing new Architecture buildings. The "added value" of unifying (rather than fragmenting) the studio spaces with classroom and crit spaces, graduate and undergraduate facilities, research and production spaces, library and information resources, digital and analogue shops, computing input and output centers, cannot be under-estimated.

3.3.1 _ Strategic Initiative 1 _ Urban Design and Community Development

The Urban Lab

Purpose:
With the rise of service learning in universities, two general models of outreach-oriented design studios have emerged: *technical design assistance programs* place students and professional staff in communities while *curriculum-based outreach programs* embed issues current and relevant to a real community in their course work. Carnegie Mellon's Urban Lab, a required 5th year urban design studio within the Bachelor of Architecture program, is one such example of a curriculum-based outreach program. Without being direct providers of technical assistance for communities, the Urban Laboratory, through a participatory design process, has worked with Mayors and elected officials, public agencies, private investors, and citizens of communities to collectively "vision" physical change within Pittsburgh neighborhoods and communities.

The Master of Urban Design Program

Program:
Through a partnership with the Master of Public Policy and Management in Carnegie Mellon's Heinz School of Public Policy, the MUD program aims to develop physical design expertise critical to establishing new directions in sustainable community design and policy. Planning-related courses about land-use, zoning, transportation and other infrastructures, real estate, economics and policy comprise the core of the Master of Urban Design degree, while the centerpiece of the curriculum is the Urban Lab.

>Provide leadership to strengthen and grow the Master of Urban Design (12 month program)

The centerpiece of the MUD program, the Urban Lab is currently taught entirely by adjunct and visiting faculty. Currently in its fourth year, the MUD program has enrolled a maximum of five students each year. The MUD program seeks a design-focused full-time experienced faculty to evaluate, strengthen and grow the program.

Students currently work in the CFA Main Studio with 4th and 5th year students during their first fall semester of the Urban Lab, and in an isolated meeting room of Margaret Morrison for their second and third semesters. The proposed MMX/Invention Works would provide space for the RCI, the Urban Lab and MUD programs to work cohesively, side-by-side.

The Remaking Cities Institute

Program:
Building on over 15 years of successes in the Urban Laboratory, the Remaking Cities Institute (RCI) was created in 2006 to ensure and expand education, community visioning, and research efforts. The mission of the RCI is to catalyze sustainable urban futures and excellence in community design. The five-year vision of the RCI is to be recognized internationally as the key resource for rebuilding urban communities, demonstrated through the revitalization of communities in the Pittsburgh region. The RCI is focused on three critical and interrelated areas: Education, Regional Impact, and Research.

Process:
The RCI uses a multidisciplinary work model to make decisions that bring aspects of land use, zoning, transportation, mixed-use development and neighborhood design together with urban geography, economics and policy. To this end, RCI benefits from the strength of the Center for Economic Development (CED), part of the H. John Heinz III School of Public Policy. The seamless integration of their expertise in the work of RCI allows us to leverage academic resources to better understand key regional economic development issues.

In 2007, RCI received a $300,00 dollar grant in order to focus for the next 12 months on the development of alternative visions for the future of the former LTV site in Hazelwood and its role in advancing sustainable development for the neighboring communities and the region in general. The competitive advantage of the Pittsburgh region in robotics, quality of life, entertainment and green technologies have the potential of fueling economic development in the future. 40 undergraduate and graduate architecture students in the Urban Lab are currently working on urban design proposals through the Urban Lab's signature participatory urban design process this fall semester. Through the spring and summer curriculum of the MUD program, students will strengthen and focus the design visions and policy strategies.

>Support the Remaking Cities Institute (RCI) as a facilitator of the Urban Lab and Master of Urban Design curriculum outreach programs

While the University and Hazelwood community have benefited significantly by the first year pilot of the Remaking Cities Institute (RCI), the SoA seeks to permanently establish the program. Headed by Luis Rico-Gutierrez, Director of the Remaking Cities Institute, the Institute also requires two part-time research assistants, and a budget for materials and publication.

Currently housed in the isolated Solar Decathlon 2005 house on campus, the RCI needs a permanent home in the collaborative MMX/Invention Works.

School of Architecture and Carnegie Mellon Qatar

Purpose:
Carnegie Mellon's School of Architecture embodies a series of strengths that could build upon the core mission of the Carnegie Mellon University Qatar in serving the students of the region, as well as in its efforts to assist the Qatar Foundation and the municipality of Doha through its research. As the capital of Qatar, Doha is a city on the precipice of immense change. Vast infrastructural investments and the alterations to the natural landscape merely mark the beginning of an enormous nation-wide project that has chosen to focus on education, culture and sports. Amidst the enthusiasm for this progressive policy, the following issues inevitably arise and require critical attention: the environmental and cultural impact of rapid urbanization.

Program: SoA is among the nation's finest programs, and is reputed internationally for its work in both community-based urban design and environmental sustainability. Within this context, in the spring of 2008, the CMU School of Architecture will offer a study abroad studio for CMU Pittsburgh students in Qatar and offer three architecture and urban design electives for CMUQ and Education City students, open to all majors: Mapping Urbanism (the only CFA course currently funded by a CMU Global Education Grant), Contemporary Middle Eastern Cities, and Architecture for Non-Majors.

Widespread support for such research-based design programs comes not only from collaborating institutions within Education City such as Carnegie Mellon University Qatar (business administration, computer science, information systems), Virginia Commonwealth University (graphic design, fashion design, interior design) and Georgetown University (foreign policy), but also key local stakeholders including: Saad Al-Mohanadi, Vice President of Capital Projects and Planning, Qatar Foundation; Ibrahim Al Jaidah, President of the Arab Engineering Bureau (the largest local architectural practice in Doha); and Mohamed Abdul Qader, Manager, Urban Planning Department, Urban Planning & Development Authority.

>Strengthen SoA globalizing education course offerings by establishing a continued program of research-based design studies for the mutual benefit of SoA and CMU Qatar

In the spring semester of 2008, the School of Architecture will offer the first CFA interdisciplinary courses at the Carnegie Mellon campus in Doha, Qatar. With current Carnegie Mellon initiatives promoting global education, the School of Architecture has worked to establish academic and professional collaboration in Qatar and aims to continue a program of research-based design education of great benefit to the School of Architecture, CMU Qatar and the municipality of Doha.

3.3.2 _ Strategic Initiative 2 _ Sustainable Design Academy, Executive Education

Our relationship with our environment and its resources is rapidly changing. Rapid growth in the developing world, climate change and energy availability have galvanized individuals, organizations and governments to commit to more sustainable practices that could yield potential benefits such as improved national security, new economic opportunities, and better quality buildings and landscapes.

The design and construction industries are at the forefront of this shift to sustainable practices. Carnegie Mellon University's School of Architecture has developed the Sustainable Design Academy to provide working professionals access to and engagement with the most current research on sustainable design practices. The SDA builds on the expertise within our world-renowned research center, Carnegie Mellon's Center for Building Performance and Diagnostics, to tailor a program that meets the unique needs of those with prior experience in design and construction fields such as architecture, landscape architecture, engineering, construction, planning, public policy, product design, ecology, and other disciplines. The program addresses the cross-disciplinary nature of sustainable design as well as skills and competencies that are specific to the core disciplines of design and construction.

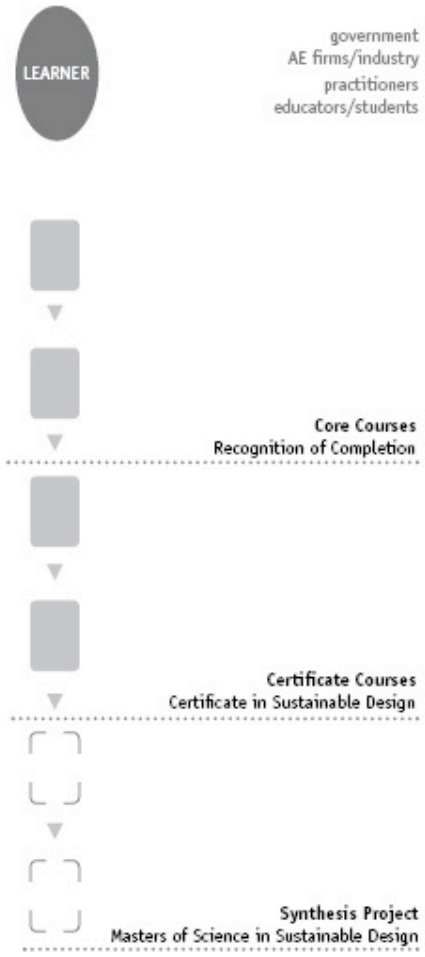
The Center conducts research, development, and demonstrations in advanced building technologies and systems integration for high performance buildings, in improved approaches to the building delivery process, and in workplace productivity. The CBPD excels in translating the lessons learned into professional practice and research. The six faculty of the Center possesses an interdisciplinary and complementary combination of backgrounds. Its expertise ranges from professional practice, to fundamental and applied research in building sciences, to advanced computer modeling/ simulation capabilities, to post occupancy evaluation and analysis.

The program places an emphasis on the implementation of sustainable design theory into real world scenarios and encourages professionals to bring past professional experiences to create an informative dialogue. Each session will provide for content on sustainable design concepts, case studies and best practices. The program provides opportunities to apply the ideas in a group setting, encouraging the development of a supportive professional network and extending the impact of the Academy far beyond the classroom setting.

The Sustainable Design Academy welcomes participation from all sectors of the design and construction fields, including government participants, architectural or engineering firms, individual practitioners, educators and students. The program is intended to draw a national and international audience as well as local participants.

The Sustainable Design Academy can design a customized curriculum that can be tailored to the students' needs and an organization's learning goals within the program's structure—Core Courses, Certificate Courses and the Synthesis Project. The two part Certificate Program (Core + Certificate Courses) is for students that want to make a commitment to ongoing education to develop a depth of knowledge. For those who wish to add the value of an accredited degree, participation in the Certificate program can count towards advanced standing in the Master of Science in Sustainable Design (MSSD) program.

The curriculum is based upon the existing MSSD program course curriculum – Core courses, Selectives courses and the Synthesis Project. All executive education students begin the program with a series of modules on fundamental topics called the Core, to build awareness and to transfer knowledge from the expertise of the CBPD faculty. Completion of the Core Units will grant the participant Recognition of Completion and the ability to proceed to the full Certificate Program.



The Certificate Program builds upon the Core coursework to expand the depth and breadth of the topics through application of the knowledge in project-based discussion and collaborations. The field of subjects can also expand to capture timely topics outside the core and will draw upon our broader university network of faculty research and resources. The Certificate Program ends with a Case Study preparatory course that can serve as a capstone or can launch the student into the Synthesis Project for the Masters Degree program.

For students wishing to leverage their Certificate work into a University accredited Masters Degree, the degree program concludes with an intensive period of on-campus contact time focused on applied research in a case study that will be built into the Synthesis Project. Students are encouraged to bring real-world scenarios to this experience as they have unprecedented access to faculty, resources and facilities in which they can test their ideas. The emphasis for the case study is on the application of relevant knowledge that will benefit the student and the organization upon return to their professional position.

The Core program includes the following coursework:

- Introduction to Sustainable Design
- Introduction to Rating Systems
- Sustainable Materials
- Productivity and Health
- Advanced Building Systems
- Renewable Energy Systems

The Selective program for the Certificate students includes the following coursework:

- Building Performance Modeling
- Enclosure Systems
- Community Development
- Construction Management
- Climate Change
- Human Factors
- LEED™
- Life Cycle Assessment
- Building Information Modeling (BIM)
- Geographic Information Systems (GIS) and others

The Sustainable Design Academy needs the following to move forward:

> **Funding to support an Executive Director position**. Although the business model shows that the Academy will be self-supporting once it is in place, initial funding is needed to create a firm foundation.

> **Teaching and administrative space within the university setting.** Although the Academy can deliver off-campus programming, the on-campus activities would enrich the opportunities for collaboration with the graduate and undergraduate communities. In early discussions with clients we heard that coming to campus is perceived as prestigious and part of the program's appeal. The opportunity to visit the IW and other regional projects to "kick the tires" is an integral part of the pedagogical experience.

> **Funding for technological support** to put content in electronic media. Each course has a start up cycle that will involve putting material into electronic formats to aid in delivering on-site and distance learning.

3.3.3 _ Strategic Initiative 3 _ Practice Management

Mission
The SoA envisions the "Architect of the Future" as a practitioner who embraces the *business* aspects of the field as well as its *creative* dimensions.

Premise
The field of architecture exists within a rich domain of models, methods, techniques, and tools that support emerging, innovative practices. These involve areas like business, management, economics, information, and building technologies. More recently, through the expansion of their own expertise into allied areas, architects began to achieve greater impact and quality, in their work. The SoA sees herself as a key agent in this development, poised to provide appropriate skill, knowledge, networking, and opportunity to facilitate, even accelerate, these advances.
This strategic direction aims to develop the necessary intellectual and resource infrastructure for creating research and educational programs in order to *acquire* and *disseminate* knowledge in several key areas: corporate architecture, service design, professional partnering, real estate economics, information based decision making, design value advocacy, and ethical conduct.

Initiatives
1. Strategic partnering with practice areas and allied fields
The significance of interdisciplinary advances and continued learning in the profession is amplified by its increasing pace of change. SOA will reexamine its curriculum to focus on the evolving role of the architect and incorporate the implications of this in design education by redefining the boundaries between practice and the academy. Practice is expected to engage academia through strategic partnering; while academia interacts with practice through continued education (Section Exec Ed). The SoA will work to create an enlightened internship program in order to utilize students as a conduit of knowledge exchange between education and practice.

In parallel to this effort, the SoA intends to strengthen its liaisons with allied fields of practice that share similar knowledge areas. Over the years, civil and environmental engineering, urban and public policy, business administration, and computer science have been some of our strategic allies. For instance, the joint Master of Science and a PhD programs in Architecture-Engineering-Construction with the Department of Civil and Environmental Engineering have been the culmination of decades of continuous faculty collaboration.
We will continue to engage the relevant units of Carnegie Mellon University in enhancing our curricular, research and professional service goals, in tandem with the strategic goals and initiatives of these units. There are four specific areas that we intend to pursue:

- Real estate economics: Since the early 1970s, the SoA has been a pioneer in this area. More recently, we have developed a relationship with the Tepper School through the real estate economics course. By expanding the participation of Tepper in this area, the SOA will explore the feasibility of adding this area of knowledge into its continued education programs and enhance relations with professionals and help in the founding of the CASCAD (below).
-
- Information and Knowledge based decision making: Since the early 1970s, the use of information technology in the delivery of architectural service and the improvement of design quality has been a long standing initiative for the SoA. The impact of this work has been evident not only in the school but also in the university and even the nation and the globe. Recently, the utilization of geographic and facility centric information has opened up new research and application venues for building utility management, first response intervention, and public health planning. The BPD and AECM Masters and PhD programs provide the intellectual armature and practice framework within which we are exploring the creation of a network of testbeds and POE studies for advanced infrastructure validation.
-
- Performance and Post Occupancy Evaluation: Both innovation and long-term performance in architecture is dependent on the quality of the integrated building systems in operation. As a result, innovative practices are shifting to "integrated design processes" from the outset of design, engaging the architect, consultants (structural, mechanical and connectivity engineers) landscape architects, interior designers, and the client, construction managers, and facilities managers. The integrated design process establishes a team decision-making methodology for the exchange of ideas and for incorporating of post occupancy evaluations to determine effective design and integration of building subsystems, including their manufacturing, construction, and management over time.
-

- Design value advocacy and ethical conduct: Primarily through course work, new areas of knowledge are being explored in the AECM and undergraduate curricula. These areas deal with age old issues under the limelight of new frameworks for design value assessment and ethical decision making. These approaches help students and professionals, to explicitly assess the tacit value that design adds to architecture and the ethical component of conduct. In the short term, the SOA will create distance learning modules and professional liaisons.

Short term: continued education, internship, curricular adjustments, publications (testbeds)
Median term: expanded continued education, institutionalized internship, testbed networking, publications (*POE, healthcare planning, design value advocacy, and ethical decision making)*
Long term: institutionalizing continued education, community outreach, complex building design consulting, corporate partnerships

2. Center for the Advancement of Service and Corporate Architecture and Design (CASCAD)

Traditionally, corporate architecture and commercial architects have been overlooked by institutions and individuals who consider "high style" design as the primary role model for academia. On the other hand, the resources, methods and business models developed to serve corporate architecture are ever expanding and helping facilitate new alliances between building sciences, business administration, environmental sustainability, economic development, and information technologies. The SOA intends to develop a center serving as a clearing house of information by archiving, analyzing, and disseminating vital information on significant corporate and commercial architecture cases. The center will disseminate its archival material in publications, symposia, and workshops attended by corporate architects and large facility holders. The archived material will also be a knowledge resource for the Strategic Partnering initiative.

Short term: planning, fund raising, and membership solicitation
Median term: archiving, workshop, symposia, and publication series
Long term: key center for collaboration between academia and commercial/corporate architecture

People
Current full-time (Omer Akin, Kristen Kurland, Laura Lee, Khee Poh Lam, Vivian Loftness) and part-time (Mark Minnerly) faculty, and the School's administrative staff are well positioned to undertake the short term strategic initiatives cited above. They are expected to carry their work well into the median term targets. In the long term, a new full time faculty in the area of practice/management/economics and a permanent administrative staff will be needed.

Resources
Primarily, the resources for archival material are expected to be digital. For non-digital material, collaboration with the university library's architectural archives will be explored.

A Proposal for a Center for the Advancement of Service and Corporate Architecture and Design (CASCAD)

Mission
The mission of the center is multifold:

1. Develop methods and models for the codification of the value of service design and corporate architecture in the Architecture, Engineering, Construction (AEC) sector.
2. Create a clearing house of information pertaining to complex service architecture and corporate architecture and the process that delivers them.
3. Through dissemination venues, build liaison between corporate clients, architects, community, and key educational programs in schools of architecture.
4. Serve as a testbed and information base for graduate research and undergraduate education in the areas of service design, and corporate architecture under the larger umbrella of AEC.

Rationale
Traditionally, corporate architecture and commercial architects have been overlooked by institutions and individuals who consider "high style" design as the primary role model for academia. On the other hand, the resources, methods and business models developed to serve corporate architecture are ever expanding and helping facilitate new alliances between building sciences, business administration, environmental sustainability, economic development, and information technologies.

By corporate architecture we refer to projects that are usually owned up by high quality professional firms that deliver high quality service to big budget clients that need complex facilities, including commercial, institutional, business, and industrial uses. Complex buildings and the rich repertoire of practice that surrounds them is under studied, poorly understood, and presents an excellent *strategic* opportunity for our faculty, well equipped with the requisite knowledge to break open this new path for the field.

The School of Architecture will develop a center serving as a clearing house of information by archiving, analyzing, and disseminating vital information on significant service, and corporate architecture cases. The center will disseminate its archival material in publications, symposia, and workshops attended by corporate architects and large facility holders, in addition to faculty and students. The archived material will also be a knowledge resource for this strategic partnering initiative.

Process

The strategic initiatives in this venture are structured under three objective categories:

- *Short term objectives*: initiate planning, fund raising, membership, and networking
- *Median term objectives*: establish archiving, analysis, meeting and publication series
- *Long term objectives*: develop collaboration between academia, commercial/corporate clients and service architects

Once a core number of potential members/underwriters from our industry and the business world endorse the proposal, the center will be formally launched. We will contact, under three categories, several business/industry entities for their endorsement and in order to develop a feasibility study.

After a feasibility study is completed, a detailed plan of execution will be put into place. This plan will outline the exact scope of services to be provided, resources to be harnessed, and the financing to be solicited. Corporate members will be asked to contribute in order to fund the center.

The center will develop an inventory of key case studies. It will develop research studies on corporate facility development, construction, operation and management, design value assessment, collaborative-design strategies, post-occupancy evaluation, advanced infrastructure systems, knowledge modeling, requirement modeling, and service architecture. Symposia, workshops, seminars, publications, and new project oriented services will be offered to center's members. For members engaged in the development of complex facilities the center will serve as a "service design consultant" providing the specialized quantitative and qualitative analysis addressing specific problems of space-resource allocation, performance standards, design value, and sustainability management.

In addition, the center is expected to influence academic objectives through acquisition and dissemination of pertinent knowledge in this area. Today's architecture graduate needs to be equipped with a knowledge and skills that demonstrate as much a command of concepts that deal with *way finding* or *net to gross ratio* as with *aesthetics*.

Principal Players

- *Large corporations* that have commissioned landmark buildings to architects: ALCOA, PPG, ATT, Citicorp, … [long list]
- *Corporate architectural firms*: KPFL, Philip Johnson, Pei Cob Freed, HOK … [this is also a very long list]
- *AEC firms*: Bechtel, Gensert, Turner, … [long list…]

Human Resource

Current full-time and part-time faculty involved in the teaching of the AECM degree program and the Practice sequence in the School of Architecture are invited to participate in the development of CASCAD. These faculty include Omer Akin, Kristine Kurland, Laura Lee, Khee Poh Lam, Vivian Loftness, and Mark Minnerly from the School of Architecture; and Burcu Akinci, James Garrett, Lucio Soibelman, and Irving Oppenheim from the Department of Civil and Environmental Engineering; not to mention, faculty in the School of Design who are engaged in the "service design" practice and research -- Shelley Evenson, (and others).

The School of Architecture's present faculty and administrative staff are well positioned to undertake the short term strategic initiatives cited above; as well as carrying their work well into the median term targets. In the long term, one new full time faculty in the area of practice/management/economics and one permanent administrative staff will be needed.

3.3.4 _ Strategic Initiative 4 _ Interdisciplinary International Internship

Executive Summary

Increasingly, practice is conducted internationally and with the participation of multiple client groups bringing multiple perspectives from multiple fields and disciplines. The greater the number of opportunities we provide our students to interact with others from other cultures and from other fields, the more potent we make their preparation for their future practice of architecture. It is the goal of the School to expand such opportunities and in way that works in the CMU context. Our initiatives in both international and interdisciplinary studies move in parallel directions. We look to 1) expand those things we are doing well—principally by expanding project coursework—and 2) handle prerequisites, scheduling and requirements in ways that open up opportunities for our students. We intend to:

>Expand participation of our students at other overseas institutions
>Expand our own offerings: keeping variety and using the project model
>Expand in-house and College project course work
>Work to make CFA operate on a prerequisite model with jointly recognized prerequisites.
>Open up our own schedule: having fewer required courses and taking a new look at scheduling

International Travel—An opportunity for all

Study abroad has been a desirable element in architecture programs since the profession first entered the academy. The careers of numerous architects—Lou Kahn's would be a prime example—have been positively influenced by well- timed and focused visits to foreign lands. So great is the value attributed to an overseas experience, that some programs, e.g. Notre Dame in Rome, have permanent overseas facilities and require participation by all. Though Carnegie Mellon once seriously considered having a permanent facility in Tours, France, a facility that would have been used for a cross-disciplinary program for CFA, in general, CMU Architecture has shied away from commitment to a permanent locale. However, the question remains: if it is so valuable for future architects, why isn't the opportunity available for all? All students take Physics. All of our students even once took Statistics. Why can't all go abroad? Our goal should be reaching the point where all our graduates have taken part in some overseas program. In the world, as it is becoming, we can do no less. How could we make an overseas experience available for all our students?

1) Expand participation of our students at other overseas institutions

Currently CMU offers joint programs at the EPFL in Lausanne, Switzerland, ITESM in Monterrey Mexico, and the National University of Singapore. These programs have the advantage of completely enmeshing students in the local culture. They avoid the condition that characterizes most US university abroad programs: that US students "hang out" with other US students. Such opportunities for full emersion need to be expanded. We should pre-qualify more professional programs at overseas universities by making sure that credits earned there map easily into graduation requirements at CMU. There is often financial benefit to students attending overseas programs where tuition is lower. Timely information (during freshman year) and prior language training are keys.

2) Expand our own offerings: keeping variety and using the project model.

CMU Architecture has also offered a considerable slate of overseas programs, in house. Principally on the initiative of individual faculty, we have led trips to a wide range of locales. These programs have had various lengths, requirements, and credit options.
2007 is a typical year. This summer Professor Khee Pho Lam has led a group of largely undergraduates on an extended study tour in China, Professors Gutshow and Damiani have led a group of undergraduates on a two-week trip to India, and this fall Professors Hutzell and el Samahy have taken a group of undergrads on a week-long trip to Doha, Qatar. The credit and circumstances varied widely among these. Lam's trip earned credit for two courses: a semester in design and an elective. The Gutschow/Damiani trip earned credit in one course and the Hutzell/el Samahy trip was conducted as part of a course and also coincided with efforts to set in place the circumstances under which Hutzell ad el Samahy will teach a joint course at CMU/Qatar the coming spring semester. Some recent polling of our students gives a good sense of the direction in which we should move if we were to expand our in-house offerings. Students tell us that our more flexible and varied approach to programs overseas is one of the reasons they chose CMU over other schools. In effect we need to find ways to do MORE of what we are already doing. To do this we need to improve alignment between faculty development opportunities and study abroad.

The model that works best at CMU is the project model. Projects have the great benefit that they engage students in meaningful ways with foreign nationals. They can also more readily match a given faculty members research, artistic or scholarly agenda. They offer the ideal condition of paralleling student and faculty self-interest. Steve Lee has involved CMU students working with German students on aspects of the Solar Decathlon. The exchanges are not superficial. They simply cannot be because work has to be produced. The imperative for production is the ice-breaker. They also have the advantage that they might be partially funded by research grants—one for example that might match the research direction of one of our architectural historians with student travel. The project model can also include artistic production. In 2003-6 and 1996, muralist Doug Cooper funded the participation of CMU CFA students in the production of murals in Rome and Frankfurt. Each of these projects had a significant language component. Because the mural work engaged local mostly non-English speaking residents, students were required to be well prepared in Italian and German prior to leaving and the bulk of the work was conducted in Italian and German respectively.

Interdisciplinary Opportunities—An opportunity for all

There have been significant strides made in increasing interdisciplinary opportunities within the college and university. The CFA Entertainment Technology course "Building Virtual Worlds has been a model for engaging our students with students from other units. Typical of what works best at CMU, it is built on the project model—students from various units are assigned on a revolving basis on five projects per semester. In a similar vein, Drama lighting specialist, Cindy Limauro's, Lighting Design course matches Art, Design Architecture and Drama students on design projects. At times her course has realized real projects such as the lighting design for the March 2006 Beaux Arts Ball. On its every-other-year cycle, the Solar Decathlon (Steve Lee) has engaged students from Drama, doing lighting, and Design, doing furnishings, with our own students in producing CMU's entry in this prestigious national competition. The College has recently initiated a required joint CFA-wide History of the Arts course—now in its second year.

But, starting with the College, there is much that needs to be done just in expanding opportunities for our students to get outside the School. It is not far from the truth to speak of the College of Fine Arts as a foreign country from the perspective of our own students. Introductory and mid-level courses within other CFA units—notably outside of history—are difficult to enter. The several schools within CFA (we are guilty here as well) seem so focused on just meeting the needs of their own majors that there is simply no room for a college-wide perspective. Even so-called "non-major courses are not always so accessible.

The second dimension of the problem is in house. While courses in units outside of CFA tend to operate on pre-requisites and are therefore available to our students, our own curriculum is so tightly and uniformly scheduled—design every M,W,F afternoon all five years— that our students simply do not have the opportunity to take them. Our initiatives need therefore to be directed at two issues: availability of courses in CFA and openness within our own schedule.

There are three initiatives that need pursuing; one builds on something we already do, project course work; the others require more long term thought and work.

1) Expand in-house and College project course work

As with Steve Lee's work on the Solar Decathlon, and the ten-year history of Virtual Worlds, project directed course work matches naturally into interdisciplinary work. It is a model that has manifestly worked well at CMU. It is well-understood, receives institutional support (and sometimes funding) and works. We need to do more of it.

2) Work to make CFA operate on a prerequisite model with jointly recognized prerequisites.

It is scandalous that architecture students cannot (except by begging) take advanced drawing courses in the Art department. This is just the tip of a closed-door iceberg that the college cannot ignore. A start is a quid-pro-quo arrangement of holding at large CFA spots in second level course work and agreeing to recognize introductory course work in one unit as prerequisite to course work in the other. Such an arrangement was once in place among all drawing instructors in the college. A similar arrangement could be made to work in other areas. Such a mechanism should be the first mechanism in a larger College-wide bargain that needs to be struck.

3) Open up our own schedule: fewer required courses and a new look at scheduling

As a faculty, we should require fewer courses and schedule them with more care for openness. Obviously there are bargains that need to be struck and discussions that need to take place along the lines of what MUST remain, and this discussion needs to be conducted with a view to the future of the profession as well as to NAAB. But these discussions must take place, and they must result in an overall reduction in the number of in–house units required by our department. CIT recently engaged in a similar process and it has units such as Civil Engineering that have assessments related to licensure. As a faculty, we must have to have the discipline to undertake the same. This mechanism alone would make more interdisciplinary course work available outside the department. But more needs to be done.

The schedule of courses needs attention. At the very least Design must be scheduled in a way that does not close off the rest of the university three afternoons a week! The chief reason design is taught in the afternoons is the number of adjunct/practitioner faculty that teach these courses and the better match of an afternoon schedule with a practice schedule. But outside of scheduling reviews, there may be no reason why Design studios taught by Full-time faculty might not be offered in the morning. They might be scheduled so that they continue to share a mid-day hour for lecture material that must be made available to all. Under such a model, some studios at a given level might be 10:30-1:30 and others 12:30-3:30 with a shared 12:30-1:30 lecture period. Thinking further out of the box might, we might consider design as a course to be scheduled at 36 units, more like a work-week, and taught on a semester-on and semester-off basis. Such a schedule would open up large blocks of time to take course work outside our own walls.*

Internship—An opportunity for all

With a potential shift to a Master of Architecture degree, a required internship period would be an opportunity and vital experience for students, and one that would not add cost or time to the 5 year program currently offered. Offering 10-week summer internships for all 3rd and 4th year students would require building relationships with 75 firms, locally, nationally and internationally, who would guarantee a paid position each year. The program would be structured to maximize the exchange of knowledge between the academy and the profession. Students could apply practice knowledge to their studies; firms could partake of the universities latest technologies, research, and especially student energy. The potential to engage alumni in such a program is most attractive.

4.0 Faculty / Staff

4.1 _ Faculty, Staff, Students

Administration

Head	Laura Lee	FAIA
Director, Graduate Program	Mark Gross	PhD

Programs

Bachelor of Architecture

First-Year	G.Damiani/D.Cooper, Coord.
Second-Year	K.Gutschow, Coordinator
Third-Year	C.Mondor/S.Lee, Coordinators
Fourth-Year	O.Akin/K.P.Lam, Coordinators
Fifth-Year	J.Kline/G.Damiani, Coordinators

Master Degrees

MS Arch. Eng. Const. Mgt.	Omer Akin	Chair
MS Architecture	Kee Poh Lam	Chair
MS Bldg. Performance	Volker Hartkopf	Chair
MS Computational Design	Mark Gross	Chair
MS Sustainable Design	Stephen Lee	Chair
Master of Urban Design	Vivian Loftness	Chair

PhD Degrees

PhD Arch. Eng. Const. Mgt.	Omer Akin	Chair
PhD Computational Design	Ramesh Krishnamurti	Chair
PhD Building Performance	Volker Hartkopf	Chair

Outreach Programs

Architecture Explorations Pre-College Program	Kelly Docter, Coordinator
Summer Internship for Diversiy (SID)	Omer Akin, Coordinator

Centers / Institutes / Labs

Center for Building Performance and Diagnostics

Director	Volker Hartkopf
Assistant to the Director	Sharilynn Jarrett
Professor	Khee Poh Lam
Professor	Steve Lee
Professor	Vivian Loftness
Engineering Consultant	David Archer
Senior Researcher	Azizan Aziz, LEED AP
Researcher	Sophie Masson
Researcher	Hongxi Lin
Technician	Jim Jarrett

Computational Design Lab (CoDe Lab)

Director	Mark Gross

Digital Fabrication Lab

Director	Jeremy Ficca

Remaking Cities Institute

Director	Luis Rico-Gutierrez

Sustainable Design Academy Executive Education

Director	Christine Mondor

Wood and Metal Shop

Director	Scott Smith

Faculty

Tenured

Professor	Omer Akin	PhD, RA
Andrew Mellon Professor	Doug Cooper	
Professor	Mark Gross	PhD
Professor	Volker Hartkopf	PhD
Professor, Associate Dean	Ramesh Krishnamurti	PhD
Professor	Khee Poh Lam	PhD, RIBA
Professor	Laura Lee	FAIA
Professor	Stephen Lee	AIA, LEED AP
University Professor	Vivian Loftness	FAIA, LEED AP
Professor of Engineering (joint appt.)	Irving Oppenheim	PhD, P.Eng
Associate Professor	Diane Shaw	PhD

Tenure Track and Full-Time Chair

Assistant Professor	Jeremy Ficca	AIA
Assistant Professor (begins 2008)	Pablo Garcia	
Assistant Professor	Kai Gutschow	PhD
Caste Assistant Professor	Kelly Hutzell	

Teaching Track

Associate Teaching Prof. (joint appt.)	Kristen Kurland	

Special Appointments

Adjunct Professor of Practice	Gerard Damiani	AIA
Adjunct Assistant Professor	Jonathan Kline	
Adjunct Assistant Professor	Christine Mondor	AIA, LEED AP
Special Faculty, Associate Dean	Luis Rico-Gutierrez	

Adjunct

Adjunct Professor	Walter Boykowycz	AIA
Adjunct Professor	Gary Carlough	AIA
Adjunct Professor	Sheldon Goettel	AIA
Adjunct Professor	Arthur Lubetz	AIA
Adjunct Professor	Gerry Mattern	P.Eng
Adjunct Associate Professor	MaryLou Arscott	RIBA
Adjunct Associate Professor	Jeffrey Davis	AIA, LEED AP
Adjunct Associate Professor	Ken Doyno	AIA
Adjunct Associate Professor	Kevin Gannon	AIA, LEED AP
Adjunct Associate Professor	Paul Rosenblatt	AIA
Adjunct Associate Professor	Dan Rothschild	AIA
Adjunct Assistant Professor	Christine Brill	RA
Adjunct Assistant Professor	Teresa Bucco	RA
Adjunct Assistant Professor	David Burns	
Adjunct Assistant Professor	Lee Calisti	AIA
Adjunct Assistant Professor	Joseph Coohill	PhD
Adjunct Assistant Professor	Sarah Drake	AIA
Adjunct Assistant Professor	Rami el Samahy	
Adjunct Assistant Professor	Matt Fineout	AIA
Adjunct Assistant Professor	Eric Fisher	AIA
Adjunct Assistant Professor	Jonathan Golli	
Adjunct Assistant Professor	Mike Gwin	AIA, LEED AP
Adjunct Assistant Professor	Erik Hokanson	AIA
Adjunct Assistant Professor	Don Johnson	RA
Adjunct Assistant Professor	Jeff King	AIA
Adjunct Assistant Professor	Jennifer Lucchino	AIA
Adjunct Assistant Professor	Mick McNutt	AIA
Adjunct Assistant Professor	Dutch MacDonald	AIA
Adjunct Assistant Professor	Chris Minnerly	AIA
Adjunct Assistant Professor	Mark Minnerly	RA
Adjunct Assistant Professor	Jason Morris	AIA
Adjunct Assistant Professor	Matt Plecity	RLA
Adjunct Assistant Professor	Robert Reid	PhD, P.Eng
Adjunct Assistant Professor	Charles Rosenblum	
Adjunct Assistant Professor	Kent Suhrbier	AIA, LEED AP
Adjunct Assistant Professor	Francesca Torello	PhD
Adjunct Assistant Professor	Spike Wolff	

Courtesy Appointments

Associate Professor of Engineering	Susan Finger	PhD, P.Eng
Professor of Drama	Cindy Limauro	
Adjunct Assistant Professor	Raymund Ryan	

Professor Emeriti

Professor	John Eberhard	FAIA
Professor	Ulrich Flemming	PhD
Professor	Delbert Highlands	RA
Distinguished Teaching Professor	David Lewis	FAIA

Staff

Administrative

Business Manager	David Koltas
Senior Admin. Associate	Kristen Frambes
Senior Academic Advisor	Heather Workinger
Coordinator of Student Programs	Alexis McCune
Financial Assistant	Diana Martin
Office Assistant	Amy Bickerton

Graduate Staff

Program Coordinator	Darlene Covington-Davis

Technical Staff

Computer Facilities Manager	
Computer Facilities Asst.	Robert Armitage
Shop Director	Scott Smith
Shop Assistant	Brian Miller

Library Staff

Sr. Architecture Librarian and Archivist	Martin Aurand

Students

Undergraduate

First-Year Students	70
Second-Year Students	60
Third-Year Students	51
Fourth-Year Students	55
Fifth-Year Students	38
Total Undergraduate Students	**274**

Masters

MS Architecture	1
MS Architecture Engineering Construction Mgmt.	6
MS Building Performance & Diagnostics	0
MS Computational Design	0
MS Sustainable Design	4
Master of Urban Design	3
Total Master Students	**14**

PhD

PhD Architecture Engineering Construction Mgmt.	2
PhD Building Performance & Diagnostics	17
PhD Computational Design	13
Total PhD Students	**32**

Outreach

Architecture Explorations (2006/2007)	605
Pre-College Students (2007)	57
Summer Institute for Diversity Students (2007)	3
Total Outreach Students	**665**

Faculty

Tenured	11	(10.5 FTE)
Tenure Track/Full Time	3	(3 FTE)
Teaching Track	1	(.5 FTE)
Special Appointment	4	(3 FTE)
Adjunct	37	(10 FTE)
Courtesy Appointment	3	(0 FTE)
Joint Appointment	2	(0 FTE)
Emeriti	4	(0 FTE)

PhD	11
FAIA	2
AIA	26
RA	5
RLA	1
RIBA	2
P.Eng	3
LEED AP	8

27 FTE:274 Students = 1:10 Faculty to Student Ratio

4.2 _ School of Architecture Faculty

Last Name	First	Rank			Terminal Degree	Terminal Degree Institution	Hire Date
Akin	Omer	Professor	RA		PhD	Carnegie Mellon University	1973 Fall
Arscott	MaryLou	Adjunct Associate Professor	RIBA		AA Diploma	Architectural Association	2007 Fall
Aurand	Martin	Sr. Arch Librarian Archivist			MLIS	University of Pittsburgh	1987 Fall
Aziz	Azizan	Senior Researcher, CBPD		LEED AP	MS Sustainable Design	Carnegie Mellon University	1997 **Fall**
Boykowycz	Walter	Adjunct Professor	AIA		MArch	Carnegie Mellon University	1969 Fall
Brill	Christine	Adjunct Assistant Professor	RA		MLArch	Penn State University	2007 Fall
Bucco	Teresa	Adjunct Assistant Professor	RA		MArch	North Carolina State University	2002 Fall
Burns	David	Adjunct Assistant Professor			MS Advanced Arch Desigr	Columbia	2003 Fall
Calisti	Lee	Adjunct Assistant Professor	AIA		BArch	Kent State University	2002 Fall
Carlough	Gary	Adjunct Professor	AIA		Barch	University of Arizona	1991 Fall
Coohill	Joe	Adjunct Assistant Professor			PhD	Oxford	2007 Spring
Cooper	Doug	Andrew Mellon Professor			BArch	Carnegie Mellon University	1976 Fall
Damiani	Gerard	Adjunct Professor	AIA		BArch	Syracuse University	1996 Fall
Davis	Jeffrey	Adjunct Associate Professor	AIA	LEED AP	BS Architecture	Univ of Illinois, Urbana-Champaign	1996 Fall
Doyno	Ken	Adjunct Associate Professor	AIA		BArch	Carnegie Mellon University	1991 Fall
Drake	Sarah	Adjunct Assistant Professor	AIA		MArch	North Carolina State University	2003 Spring
el Samahy	Rami	Adjunct Assistant Professor			MArch	Harvard	2006 Fall
Ficca	Jeremy	Assistant Professor	AIA		MArch	Harvard	2007 Fall
Fineout	Matt	Adjunct Assistant Professor	AIA		MArch	SCI-Arc	2001 Spring
Fisher	Eric	Adjunct Assistant Professor	AIA		MArch	Harvard	2001 Spring
Gannon	Kevin	Adjunct Associate Professor	AIA	LEED AP	MArch	Yale	1996 Fall
Goettel	Sheldon	Adjunct Professor	AIA		BArch	Carnegie Mellon University	1990 Spring
Golli	Jonathan	Adjunct Assistant Professor			MArch	University of Toronto	2007 Fall
Gross	Mark	Professor			PhD	MIT	2004 Fall
Gutschow	Kai	Assistant Professor			PhD	Columbia	1998 Spring
Gwin	Michael	Adjunct Assistant Professor	AIA	LEED AP	BArch	Virginia Tech	2007 Spring
Hartkopf	Volker	Professor, Director CBPD			PhD	University of Stuttgart	1972 Fall
Hokanson	Erik	Adjunct Assistant Professor	AIA		BArch	Kansas State University	2006 Spring
Hutzell	Kelly	Caste Assistant Professor			MS Arch. + Urban Design	Columbia	2005 Fall
Johnson	Donald	Adjunct Assistant Professor	RA		MArch	Yale	2006 Fall
King	Jeffrey	Adjunct Assistant Professor	AIA		MArch	Tulane	2004 Fall
Kline	Jonathan	Adjunct Assistant Professor			MFA	Penn State University	2002 Fall
Krishnamurti	Ramesh	Professor			PhD	Waterloo	1989 Fall
Kurland	Kristen	Associate Teaching Professor			BArch	University of Pittsburgh	1996 Fall
Lam	Khee Poh	Professor	RIBA		PhD	Carnegie Mellon University	2003 Fall
Lee	Laura	Professor, Head	FAIA		MArch	University of Michigan	1989 Fall
Lee	Stephen	Professor	AIA	LEED AP	March Building Studies	Carnegie Mellon University	1985 Fall
Limauro	Cindy	Professor, Drama			MFA in Lighting Design	Florida State University	1987 Fall
Loftness	Vivian	University Professor	FAIA	LEED AP	MArch	MIT	1981 Fall
Lubetz	Arthur	Adjunct Professor	AIA		BArch	Carnegie Mellon University	1988 Fall
Lucchino	Jennifer	Adjunct Assistant Professor	AIA		MArch	Rice University	2003 Fall
MacDonald	Dutch	Adjunct Assistant Professor	AIA		BArch	Carnegie Mellon University	2006 Fall
Mattern	Gerry	Adjunct Professor	P Eng		BSEE	Rose Polytechnic	1982 Fall
McNutt	Mick	Adjunct Assistant Professor	AIA		BArch	Syracuse University	2007 Spring
Minnerly	Chris	Adjunct Assistant Professor	AIA		BArch	Cornell	2006 Fall
Minnerly	Mark	Adjunct Assistant Professor	RA		BArch	Cornell	2007 Fall
Mondor	Christine	Adjunct Assistant Professor	AIA	LEED AP	BArch	Carnegie Mellon University	1999 Fall
Morris	Jason	Adjunct Assistant Professor	AIA		MArch	Illinois Institute of Technology	2005 Fall
Oppenheim	Irving	Professor	P Eng		PhD	Cambridge	1972 Fall
Plecity	Matthew	Adjunct Assistant Professor	RLA		MArch	Virginia Tech	2006 Fall
Reid	Robert	Adjunct Assistant Professor	P Eng		PhD	Carnegie Mellon University	2005 Fall
Rico-Gutierrez	Luis	Associate Dean, CFA			MS Building Performance	Carnegie Mellon University	2001 Fall
Rosenblatt	Paul	Adjunct Associate Professor	AIA		MArch	Yale	1996 Fall
Rosenblum	Charles	Adjunct Assistant Professor			M Arch History	University of Virginia	2000 Fall
Rothschild	Dan	Adjunct Associate Professor	AIA		MArch	North Carolina State University	2003 Fall
Ryan	Raymund	Adjunct Assistant Professor			MArch	Yale	2005 Spring
Shaw	Diane	Associate Professor			PhD	University of California - Berkeley	1996 Fall
Smith	Scott	Director, Shop			MFA	Cranbrook	1984 Spring
Suhrbier	Kent	Adjunct Assistant Professor	AIA	LEED AP	BArch	Carnegie Mellon University	2000 Fall
Torello	Francesca	Adjunct Assistant Professor			PhD	Politecnico Torino	2007 Fall
Wolff	Spike	Adjunct Assistant Professor			MArch	SCI-Arc	2003 Fall

4.3 _ University, College, School Committees

University Committees
(Architecture Representatives)

Associate Deans Council for Graduate Education
Luis Rico-Gutierrez

Associate Deans Council for Graduate Policy
Ramesh Krishnamurti

Associate Deans Council for Undergraduate Education
Luis Rico-Gutierrez

Campus Design Visioning Committee
Gerard Damiani
Raymund Ryan

Design Review Committee
Laura Lee
Vivian Loftness

Diversity Council
Omer Akin
Darlene Covington-Davis
Luis Rico-Gutierrez, Chair of Faculty Workgroup

Education Committee
Vivian Loftness

Educational Facilities Committee
Ramesh Krishnamurti, Chair

Faculty Senate
Vivian Loftness, Chair

Faculty Senate Library Committee
Kai Gutschow

Green Practices Committee
Steve Lee, Co-Chair
Christine Mondor

Heinz School Health Care and Environment Committee
Kristen Kurland

Institutional Animal Care and Use
Kristen Kurland

International Committee
Vivian Loftness
Luis Rico-Gutierrez

Library Representative for Arch.
Steve Lee

Research Council
Ramesh Krishnamurti

Rhodes, Marshall, Cambridge Scholarships
Irving Oppenheim

Ryan Award Committee
Steinbrenner Institute WaterQUEST
Kristen Kurland

College Committees
(Architecture Representatives)

CFA College Review Committee
Laura Lee
Irving Oppenheim
Ramesh Krishnamurti

CFA College Council
Laura Lee
Kai Gutschow
Ramesh Krishnamurti
Luis Rico-Gutierrez

CFA College Research Committee
Ramesh Krishnamurti, Chair
Kai Gutschow
Khee Poh Lam

CFA Studio for Creative Inquiry Advisory Committee
Ramesh Krishnamurti, Director
Architecture Representative

CFA/HSS Center for the Arts in Society
Doug Cooper
Kai Gutschow
Diane Shaw

CIT College Review Committee
Irving Oppenheim

Heinz School Review Journal Board of Advisors
Kristen Kurland

Heinz School Arts Management Committee
Kristen Kurland

School Committees
(Administrative)

School Review Committee Promotion and Tenure
Khee Poh Lam, Chair
Omer Akin
Doug Cooper
Mark Gross
Volker Hartkopf
Ramesh Krishnamurti
Laura Lee
Steve Lee
Vivian Loftness
Irving Oppenheim
Diane Shaw

MS/PhD Committees
Mark Gross, Chair
Omer Akin
Volker Hartkopf
Ramesh Krishnamurti
Khee Poh Lam
Laura Lee
Steve Lee
Vivian Loftness

School Committees
(Faculty)

Admissions
Doug Cooper, Chair
Kai Gutschow
Alexis McCune
Heather Workinger

AIA Board
Laura Lee, Ex-Officio

Awards
Kelly Hutzell, Chair
Alexis McCune
Matt Plecity

Computing
Mark Gross, Chair
Jeremy Ficca
Kristen Kurland
Mike Weller, Graduate Student
Rep. Undergraduate Student

Executive Education/SDA
Christine Mondor, Director
Azizan Aziz
Dave Koltas

Faculty Colloquium
Omer Akin, Chair

Faculty Search
Diane Shaw, Chair
Steve Lee
Christine Mondor

Graduate Fellowship
Omer Akin, Chair
Ipek Ozkaya
Ulrich Flemming
Chris Yessios (alumnus)

Highlands Fund
Doug Cooper, Chair
Dan Garber (alumnus)
Sheldon Goettel

Lectures
Name, Chair
Raymund Ryan

Remaking Cities Institute (RCI)
Luis Rico-Gutierrez, Director
Don Carter (alumnus)
Kenneth Doyno
Rami el Samahy
Ray Gindroz (alumnus)
Bob Gradek (Heinz School)
Kelly Hutzell
Jonathan Kline
Kristen Kurland
David Lewis

Thesis
Gerard Damiani

Undergraduate Curriculum
Steve Lee, Chair
Kai Gutschow (design)
Diane Shaw (history)

School Committees
(Graduate Students)

Graduate Student Committee
Brad Guy, PHD Representative
Alankrita Prasad, MS Representative

Graduate Student Association
Fred Betz, Architecture Rep.

Social Committee
Pallovi Mantha
Bing Dong
Yang Hu

Computing Representative
Mike Dong

Lounge Representatives
Kui Yue
Reshma Kulkarni
KwangJun Lee

School Committees
(Undergraduate Students)

Student Advisory Council (SAC)

First-Year Representatives
Zach Cohen, Yellow Studio
James Garvey, Red Studio
Franklin Krouse, Blue Studio

Second-Year Representatives
Elizabeth Duray
Ellen Garrett
Matt Huber

Third-Year Representatives
Andrew Butchko
Raedun Knutsen
Jaclyn Paceley

Fourth-Year Representatives
Carolyn Caranante
Caitlin Olivo
Andrew Werner

Fifth-Year Representatives
Zach Hartle
Meredith Magin
Chang Zhang

American Institute of Architecture Students
(Executive Committee)

Gregory Tanski, President
Christian Wagner, Vice President
Erin Calma, Treasurer
Chris Gallot, Special Programs
Allison Lukacsy, I-AM Representative
Jerome Williams, Carnival Rep.

4.4 _ Faculty Appointments, Salaries, Diversity

School of Architecture Named Professorships and Chairs

Vivian Loftness, FAIA	University Professor
Douglas Cooper	Andrew W. Mellon Professor
Kelly Hutzell	Caste Career Development Professorship in Urban Design and Architecture
Matthias Frey (2008)	T. David Fitzgibbon Visiting Professorship

School of Architecture Joint Appointments

Irving Oppenheim, PhD	Professor of Civil Engineering	teaching structures
Kristen Kurland	Associate Teaching Professor, Heinz School of Public Policy	teaching BIM and GIS

School of Architecture Courtesy Appointments

Larry Cartwright	Teaching Professor of Civil and Environmental Engineering	teaching Design / Build
Susan Finger, PhD	Associate Professor of Mechanical Engineering	teaching Arch Engineering Construction Mgmt.
Cindy Limauro	Professor of Drama, Lighting Design	teaching Architectural Lighting Design
Robert Reid, PhD	Dept. of Mechanical Engineering	teaching Physics for Architecture
Raymund Ryan	Carnegie Museum, Heinz Architectural Center	collaborating on Lectures and Exhibitions

School of Architecture faculty with Courtesy Appointments at Carnegie Mellon

Omer Akin, PhD	Department of Civil and Environmental Engineering
Mark Gross, PhD	Human Computer Interaction Institute
Diane Shaw, PhD	Department of History

Faculty Salaries

		00/01	01/02	02/03	03/04	04/05	05/06	06/07
Professor	Minimum Salary	73,285	78,185	79,235	75,175	80,000	81,600	84,456
	Maximum Salary	107,675	107,160	109,840	118,810	115,600	121,000	124,630
	Average Salary	89,232	90,292	87,554	93,991	94,711	98,770	101,794
	University Average	99,700	108,792	109,381	114,748	118,399	123,784	127,026
Associate Professor	Minimum Salary	52,910	--	58,270	61,350	63,200	66,500	75,145
	Maximum Salary	70,875	--	60,010	66,010	110,000	66,500	75,145
	Average Salary	60,608	--	59,140	63,680	81,067	66,500	75,145
	University Average	69,700	78,526	79,038	82,253	84,511	89,091	93,205
Assistant Professor	Minimum Salary	42,000	43,260	44,560	45,895	47,300	50,140	57,661
	Maximum Salary	52,900	56,570	55,775	60,310	47,300	50,140	57,661
	Average Salary	45,633	54,453	50,168	53,103	47,300	50,140	57,661
	University Average	63,200	69,780	68,829	71,223	75,186	80,542	82,894

Faculty Diversity

		00/01	01/02	02/03	03/04	04/05	05/06	06/07
Tenured	African American	--	--	--	--	--	--	--
	American Indian	--	--	--	--	--	--	--
	Asian/Pacific Island	--	1	--	1	1	1	1
	Hispanic Origin	--	--	--	--	--	--	--
	Women	1	1	1	2	2	2	2
Professor	African American	--	--	--	--	--	--	--
	American Indian	--	--	--	--	--	--	--
	Asian/Pacific Island	--	1	--	1	1	1	1
	Hispanic Origin	--	--	--	--	--	--	--
	Women	1	1	1	1	1	2	2
Associate Professor	African American	1	--	--	--	--	--	--
	American Indian	--	--	--	--	--	--	--
	Asian/Pacific Island	--	--	--	--	--	--	--
	Hispanic Origin	--	--	--	--	--	--	--
	Women	3	1	2	1	2	1	1
Assistant Professor	African American	1	--	--	--	--	--	--
	American Indian	--	--	--	--	--	--	--
	Asian/Pacific Island	2	--	--	--	--	--	--
	Hispanic Origin	--	--	--	1	--	--	1
	Women	7	2	1	1	3	3	3

4.5 _ Faculty Administration and Service

Ömer Akın

Admin School	Program Coordinator	Summer Internship for Diversity
Admin School	Track Chair	MS/PhD AECM
School	Program Coordinator	Fall 4th Year
School	Chair	Faculty Colloquium Committee
School	Chair	Graduate Fellowship Committee
School	Member	School Review Committee
School	Member	MS/PhD Committee
University	Member	Diversity Council

Douglas Cooper

School	Chair	Highlands Fund Committee
School	Chair	Admissions Committee
School	Member	School Review Committee
College	Member	Center for Arts and Society
University	Chair	Educational Facilities

Mark D. Gross

Admin School	Director	Graduate Program
Admin School	Director	CoDe Lab
Admin School	Track Chair	MS Computational Design
School	Chair	MS/PhD Committee
School	Chair	Computing Committee
School	Member	School Review Committee
Community	Volunteer firefighter	Four Mile Canyon Fire Department

Volker Hartkopf

Admin School	Director	Center for Building Performance
School	Member	School Review Committee
School	Member	MS/PhD Committee
Community	Trustee / Board Member	Pittsburgh History and Landmarks Foundation Board
Professional	Pilot Partner	Laboratories for the 21st Century, EPA/DOE/CMU
Professional	Member	United Nations UNEP Sustainability Task Force

Ramesh Krishnamurti

Admin College	Associate Dean	Research, College of Fine Arts
Admin College	Director	Studio for Creative Inquiry
Admin School	Track Chair	PhD, Computational Design
School	Member	School Review Committee
School	Member	MS/PhD Committee
College	Chair	College Research Committee
College	ex-officio	College Review Committee
College	ex-officio	College Council
University	Member	Research Council
University	Member	Associate Deans Council for Graduate Policy
Professional	Editorial Board	Building and Environment
Professional	Editorial Board	Languages of Design

Khee Poh Lam

Admin School	Track Chair	Master of Science in Architecture
Admin School	Track Chair	MS/PhD BPD
School	Chair	School Review Committee
School	Program Coordinator	Spring 4th Year
School	Member	MS/PhD Committee
College	Member	College Research Committee
University	Member	Fulbright Committee

Laura Lee

School	ex-officio	School Review Committee
School	Member	MS/PhD Committee
College	Member	College Review Committee
College	Member	College Council
University	Member	Design Review Committee
Professional	Team Chair	National Architectural Accrediting Board
Professional	Board Member ex-officio	AIA Pittsburgh
Professional	IDP Educator Coordinator for CMU	NCARB

Stephen Lee

Admin School	Track Chair	MS, Sustainable Design
School	Chair	Undergraduate Curriculum
School	Member	School Review Committee
School	Member	Faculty Search Committee
School	Member	MS/PhD Committee
School	Program Coordinator	Spring 3rd Year
University	Co–Chair	Green Practices Committee
University	Member	Library Representative for Architecture
Community	Member	Industrial and Professional Advisory Council, College of Engineering, Pennsylvania State University
Community	Member	Carpenters' JATC Annual Apprentice Contest, Planning Committee
Community	Facilitator/Judge	Brick Layers and Allied Craftworkers' Annual Apprentice Contest

Vivian Loftness

Admin School	Track Chair	M, Urban Design
School	Member	School Review Committee
School	Member	MS/PhD Committee
University	Chair	Faculty Senate, ex-officio Board of Trustees 2007-2008
University	Member	Design Review Committee
University	Member	Education Committee
University	Member	International Committee
Community	Member	Heinz Foundation Civic Design Task Force
Community	Member	Riverlife Urban Design Committee
Community	Advisor	Ellis School, Academic Facilities Committee
Professional	Member	World Business Council for Sustainable Development, Global Assurance Team
Professional	Board Member	US Green Building Council National Board (elected)
Professional	Board Member	AIA Communities by Design National Executive Committee
Professional	Board Member	Turner Construction Green Building Advisory Board
Professional	Board Member	USGBC Technical Scientific Advisory Council, National Research Committee
Professional	Editorial Board	Building and Environment
Professional	Editorial Board	Journal of Corporate Real Estate

Irving Oppenheim

School	Member	School Review Committee
College	Member	College Review Committee
College (CIT)	Member	College Review Committee
University	Advisor	Rhodes, Marshall, and Gates Cambridge Scholarships
Professional	Editorial committee	Journal of Aerospace Engineering

Diane Shaw

Admin School	Program Coordinator	Study Abroad
School	Member	School Review Committee
School	Chair	Faculty Search Committee
School	Member	Architectural History Curriculum Committee
University	Member	Center for the Arts in Society (arts histories curriculum)

Jeremy Ficca

Admin School	Director	Digital Fabrication Lab
School	Program Coordinator	Spring 2nd Year
School	Member	Computing Committee

Kai Gutschow

School	Program Coordinator	Fall 2nd Year
School	Program Coordinator	Spring 2nd Year
School	Member	Admissions Committee
School	Member	Studio Curriculum Committee
College	Member	College Council
College	Member	College Research Committee
College	Member	Center for Arts in Society (Lecture + Fellowships)
University	Member	Faculty Senate Library Committee

Kelly Hutzell

School	Chair	Awards Committee
School	Member	Remaking Cities Institute
Professional	Guest Teacher	Learning By Design, Boston Society of Architects

Kristen Kurland

School	Member	Computing Committee
School	Member	Remaking Cities Institute
College (Heinz)	Member	Heinz School Review Journal Board of Advisors
College (Heinz)	Member	Heinz School Arts Management Committee
University	Member	Steinbrenner Institute
University	Member	Heinz School Heath Care & Environment Committee
University	Member	Institutional Animal Care & Use Committee
University	Member	WaterQUEST
University	Member	Ryan Award Committee
Professional	Member of Advisory Board	University of Pittsburgh, Graduate School of Public Health, Department of Epidemiology, Academic Consortium for Excellence (UPACE)
Professional	Member	Allegheny County Medical Society, West PA Obesity Taskforce
Professional	Member	Highmark, Childhood Obesity Regional Strategy Committee
Professional	Member	URISA (Urban and Regional Information Systems)
Professional	Member	Board of Advisors, ITT Technical Institute

Gerard Damiani

School	Chair	Thesis Committee
School	Member	Faculty Search Committee
School	Program Coordinator	Fall 1st Year
University	Member	Campus Design Visioning Committee
Professional	Member	School of Architecture Advisory Board, Kent State University

Christine Mondor

Admin School	Director	Executive Education Program Sustainable Design Academy
School	Program Coordinator	Fall 3rd Year
School	Member	Faculty Search Committee
University	Member	Green Practices Committee
Community	Committee Leader	Dilworth Academy Edible Schoolyard Project
Professional	Project Committee	Friendship Development Association
Professional	Member	Community Design Center of Pittsburgh

Luis Rico-Gutierrez

School	Director	Remaking Cities Institute
College	Associate Dean	College of Fine Arts
College	ex-officio	College Council
University	Member	Diversity Council; Chair of Faculty Workgroup
University	Member	Internationalization Committee
University	Member	Associate Deans Council for Graduate Education
University	Member	Associate Deans Council for Undergraduate Education
Professional	Trustee / Board Member	Pittsburgh History and Landmarks Foundation
Professional	Member	ICFAD / International Council of Fine Arts Deans
Professional	Chair	ICFAD, Innovations and New Directions Taskforce

5.0 Undergraduate Program

5.1 _ Admissions

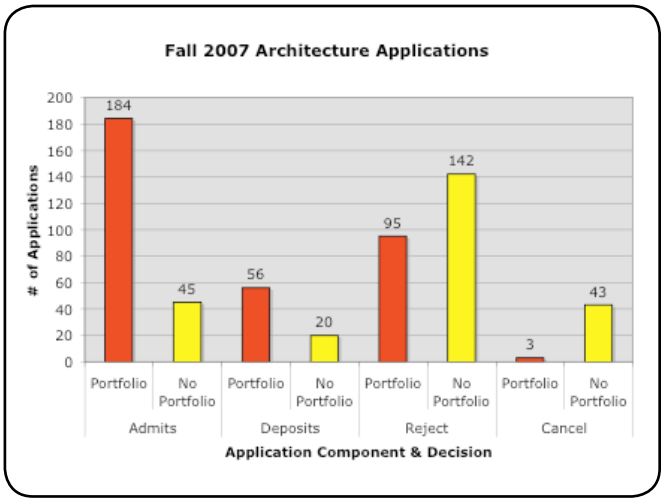
	2000	2001	2002	2003	2004	2005	2006	2007*
Applicants	386	408	353	385	428	523	720	513
Offers	229	223	204	208	226	223	259	222
Target	68	68	68	66	66	66	66	
Accepted	73	73	73	67	74	74	77	75
Acceptance Rate	59.3%	54.7%	57.8%	54.0%	52.8%	42.6%	36.0%	43.3%
Forfeited		3	2	3	3	4	0	1
Deferred		3	3	2	0	1	1	2
Yield	31.9%	32.7%	35.8%	32.2%	32.7%	33.2%	29.7%	34.7%
Graduates	37	41	52	49	49	45	34	
Attrition Rate	49.9%	43.8%	28.8%	26.9%	33.8%	39.2%	44.1%	

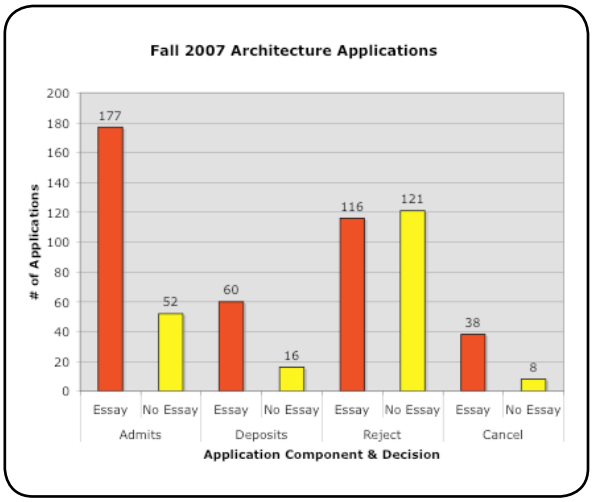
*New Requirements – Fall 2007

This past year the School of Architecture added three new requirements (essay, optional interview, and optional portfolio) to their application. The information below is a representation of the applications that where submitted, as they relate to the new application requirements.

	Applications		Admitted		Rejected		Cancelled		Deposit	
Essay	331	65%	177	34.60%	116	22.70%	38	7.40%	60	11.70%
No Essay	181	35%	52	10.20%	121	23.60%	8	1.60%	16	3.10%
Portfolio	282	55%	184	35.90%	95	18.60%	3	0.60%	56	10.90%
No Portfolio	230	45%	45	8.80%	142	27.70%	43	8.40%	20	3.90%

- 77.3% of those students that were admitted into the School of Architecture submitted an essay
- 80.3% of those students that were admitted into the School of Architecture submitted a portfolio
- 78.9% of those students that enrolled into the School of Architecture submitted an essay
- 73.7% of those students that enrolled into the School of Architecture submitted a portfolio
- 132 or 57.6% of those students that were admitted into the School of Architecture submitted both an essay AND a portfolio
- 45 or 59.2% of those students that enrolled into the School of Architecture submitted both an essay AND a portfolio





5.1 _ Admissions

School of Architecture Rebuilds Admission Process

During the last two decades, student admission into colleges and universities has undergone a significant transformation. Prospective students frequently use electronic means to learn about a university's academic programs, student life and activities. Sometimes students complete the application process and enroll in the school without having any one-on-one contact with the university. For this reason and others, the School of Architecture at Carnegie Mellon has revisited its admission process.

The emerging changes in the process aim to better match prospective students to the School, continue to attract high caliber applicants and improve diversity in the student population. The School is looking at new ways of communicating with applicants and will institute an optional portfolio review for the first time in 25 years. The portfolio review will bring faculty and candidates in direct contact with each other while reviewing, discussing and evaluating creative work.

The School is also focusing on ways to attract and keep quality students in the process through visitation programs. Campus visits will provide exposure to regular studio and lecture classes, special public lectures and exhibitions, and will include participation from current architecture students and faculty.

Diversifying its student population is another focus for the School, seeking students from a broader socioeconomic, geographic, international and racial background. The School intends to expand its reach through counselor visits in urban, integrated, nationally distributed and internationally represented high schools.

The renewed emphasis on one-on-one contact is considered a complement to the Web-based activities to keep students better informed throughout the admission process. Different electronic methods like digital media, online information and chats will help students gain information about the School of Architecture, its admission process and provide other methods for applicants to contact members of the school.

With the School's renewed focus on the student centered approach to the admission process, it hopes to better engage students as they learn more about architecture at Carnegie Mellon. The School of Architecture plans to improve the admission process and the quality of the education that it provides. To learn more about applying to the School of Architecture, visit <www.cmu.edu/admission/finearts>.

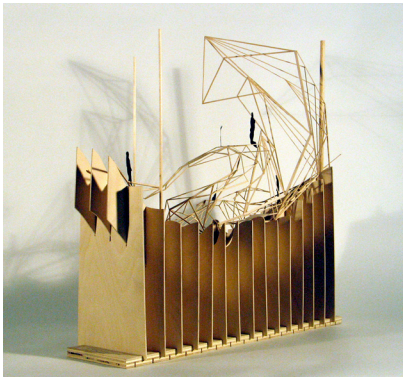
The ideal portfolio:

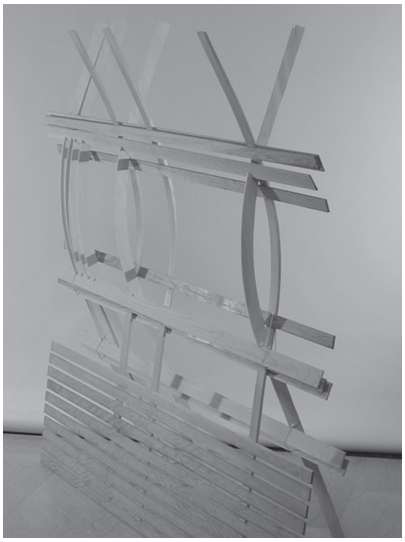
- reflects student passion and commitment to architecture in creative ways.
- tells the story of the students artistic and intellectual work through drawings, sketches, paintings and 3-dimensional work, as well as inventions, compositions, literary and expressive works of all kinds.

5.1 _ Admissions _ First-Year Experience









5.2 _ Student Statistics

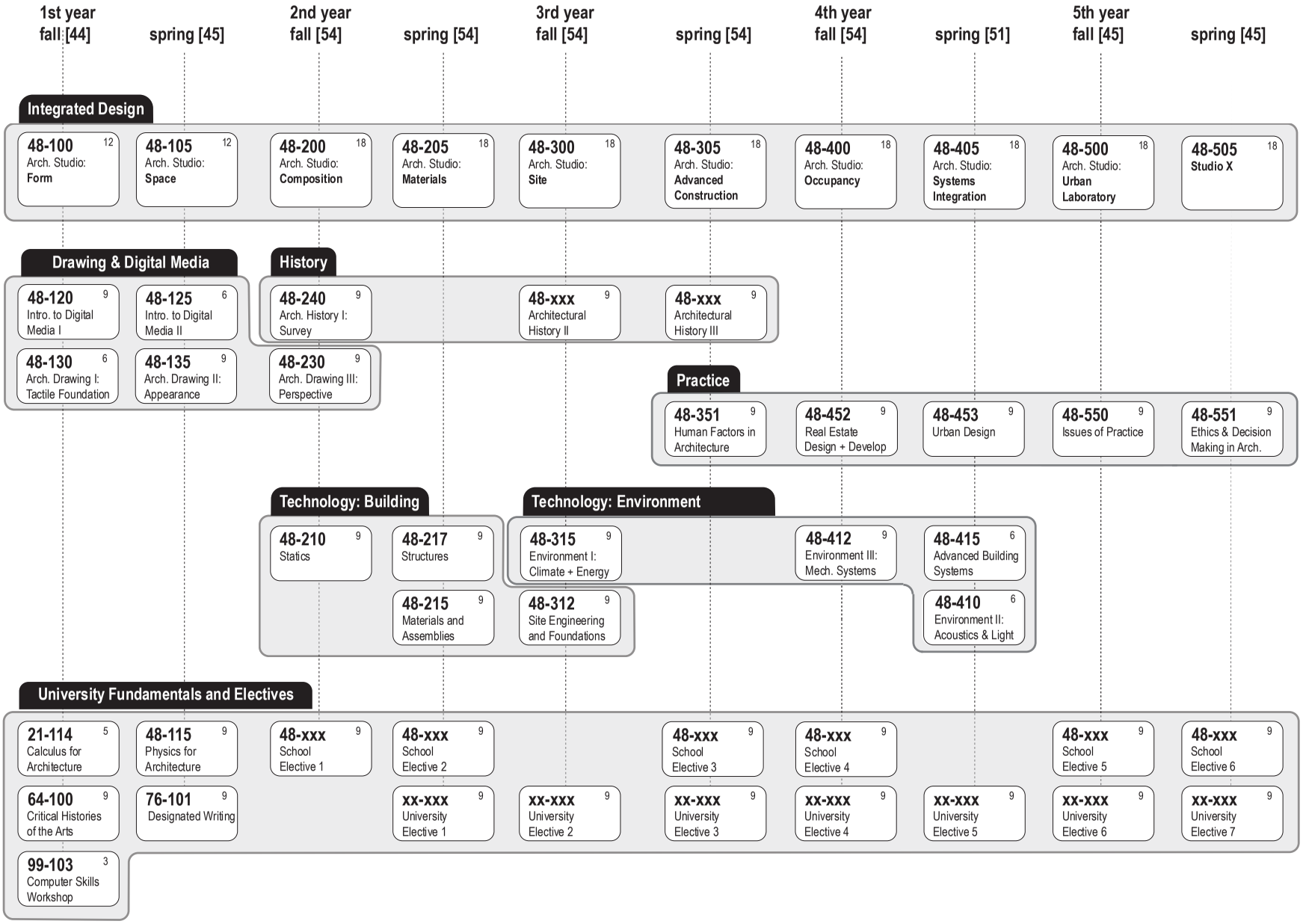
	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
Full-Time Students	272	258	269	275	256	256	271
Part-Time Students	1	3	4	1	4	3	3
FTE Students	272.5	260	27.11	275.5	257	257.9	273.4
Arch Design Studio Students	273	261	270	273	251	263	267
Outside Students Served by Department	45	50	80	55	56	52	76
African American Students	6	6	14	12	14	13	14
Native American Students	0	0	2	1	1	1	1
Asian/Pacific Students	62	84	58	51	47	44	54
Hispanic Origin Students	20	16	19	19	18	20	22
Women Students	133	122	125	122	125	127	128
Foreign Students	60	24	35	34	31	25	30
Total Degrees Awarded	44	53	50	49	45	42	41
Graduates Finished in Established # of Years	99%	50	47	94%	96%	96%	96%
Degrees Awarded Women	13	23	15	17	20	23	18
Degrees Awarded African American	1	0	2	2	1	1	0
Degrees Awarded American Indian	0	0	0	0	0	0	1
Degrees Awarded Asian/Pacific.	8	14	7	13	18	8	6
Degrees Awarded Hispanics	1	2%	1	2	2	0	3
Number of Applicants	440	368	395	354	515	703	523
Number Accepted	236	202	205	204	222	253	240
Enrollment Target/Goal	70	70	65	68	68	75	75
Student / Faculty Ratio	11	11	11	11	11	11	10

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total Graduating Students	42	38	44	53	50	49	45	42	42
Total Minors Received	19	16	38	27	24	20	17	14	8
Number of Graduates with Minors	18	14	28	23	18	17	16	12	8
Percent of Graduates with Minors	42%	36%	63%	43%	36%	34%	35%	28%	19%
Total Double Majors	1	2	1	2	2	1	--	3	4
Non-Arch. Students Minoring in Arch.	6	5	9	10	8	9	15	18	6

MINORS	2000	2001	2002	2003	2004	2005	2006	2007
Architecture History	4	8	6	4	5	--	2	1
Art	1	--	1	1	--	--	--	--
Building Science	1	--	--	--	--	--	--	--
Business Administration	3	18	7	7	7	8	2	1
Communication Design	--	2	--	2	--	1	--	--
Computer Science	--	--	--	--	--	--	--	--
Creative Writing	--	--	--	--	--	--	1	--
Dance	--	--	--	--	1	--	--	--
Drama	--	--	--	--	2	1	--	--
Engineering Studies	1	2	1	--	--	--	--	--
English	--	--	--	--	1	--	--	--
Environmental Studies	--	--	--	--	--	--	--	1
European Studies	--	--	1	--	--	--	--	--
Film & Digital Imaging	2	--	1	1	--	--	--	--
Fine Arts Interdisciplinary	--	--	1	--	--	--	--	--
French	--	1	2	--	--	--	--	--
German	--	--	--	--	--	--	--	1
Hispanic Studies	--	--	--	--	--	--	--	1
History	--	1	1	--	2	1	--	--
History of the Arts	1	--	--	1	--	--	--	--
Industrial Design	--	1	--	--	--	2	1	--
Japanese	--	1	--	--	--	--	--	--
Jazz Performance	--	--	1	1	--	1	--	--
Literary & Cultural Studies--	--	--	--	--	--	--	--	
Minority Studies	--	--	1	--	--	--	--	--
Multimedia Production	--	--	--	--	--	--	1	--
Music Performance	--	--	--	--	--	--	1	--
Photography & Digital Imaging	2	4	3	4	1	1	--	--
Photography & Film	--	--	1	1	--	1	--	--
Physics	--	--	--	--	--	--	--	--
Psychology	--	1	--	1	1	1	1	--

DOUBLE MAJORS	2000	2001	2002	2003	2004	2005	2006	2007
Anthropology and History	--	--	--	--	--	--	1	--
Business Administration	1	--	--	--	--	--	--	--
French	--	1	--	--	--	--	--	--
German	--	--	--	--	--	--	--	1
Hispanic Studies	--	--	--	--	--	--	1	--
History & Policy	--	--	1	--	--	--	--	--
Human-Computer Interaction	--	--	--	--	1	--	--	--
International Relations	--	--	--	--	--	--	--	1
Social and Cultural History	--	--	--	--	--	--	1	--
Spanish	1	--	--	--	--	--	--	--

5.3 _ Bachelor of Architecture Curriculum



5.4.1 Curriculum Stream 1 _ Design Studio and Thesis

Carnegie Mellon School of Architecture is committed to the creation and development of an architectural design education that is reflective, current, and forwarding thinking while also preparing our students to become visionaries and leaders in our global discourse on architecture and culture.

Can we as educators learn from the current technology and the way it is changing architect's practice and communication with their clients? One possible and relevant comparable method is the term Integrated Practice. During the 2006 AIA National Convention in Los Angeles, ten essays were presented by leaders in many disciplines on the state of Integrated Practice and Integrated Building. Integrated Practice by definition leverages early contributions of knowledge through the utilization of new technologies, allowing architects to better realize their highest potentials as designers and collaborators while expanding the value they provide throughout the project's lifecycle. Integrated Building Design is a process of design in which multiple disciplines and seemingly unrelated aspects of design are integrated in a manner that permits synergistic benefits to be realized. If we were to apply this to architectural education, it could enable us as a faculty to work together from the outset of our students' education to develop a model curriculum that has comprehensive benefits.

It is the goal of the design curriculum at Carnegie Mellon to link the School's faculty and convey their expertise to the students through a studio curriculum that is based on cumulative knowledge -- always building upon what the students have learned in the past semesters and how it is a relevant starting point for the next. The faculty and students at Carnegie Mellon come from an international context and, as a School, it is our mission to be expressive of our diversity in our curriculum. In our rapidly changing global world, we are committed to making our students aware of the necessary foundations on which our profession is based.

By engaging in the core parts of our curriculum, the student is introduced to the basic framework of our professional course of study. The beginning design studios rely on methods such as visual communication and developing an awareness in spatial thinking. Co-requisite courses, such as the College of Fine Arts' Critical History of the Arts, Drawing, and Computer Modeling, allow knowledge gained to be directly applied into the design studio. Students are able to quickly see the necessity for analog drawing while understanding how digital forms of representation can help answer new questions for which analog skills would have difficulty in solving.

By creating shared values in the first three years of studio, the students are introduced incrementally to the faculty and their expertise as well as the essential issues facing our profession. In the first three years the student is introduced to architectural design through a series of studios in which space, context, program, materials, craft, construction and detailing are introduced. Information is also gained by studio introductions into other importance aspects of our curriculum.

As the students continue through the first three years, elemental issues are built upon through an additive process of studio projects. Each semester introductory lessons of other relevant parts of our curriculum are introduced. For example -- during a students' first semester they are introduced to terms such as embodied energy, systems integration, and landscape engineering. This allows the students to make clear links to later co-requisite courses as they relate to sustainability, ecology, materials, site engineering, urban design, etc. Faculty experts elaborate upon the issues explored in earlier studios in later studios so the students can observe how all aspects of their design education work with each other. This allows each design studio is to take a position based on the students' knowledge to date while adding through a synthesis the new topic to be introduced. This process fosters critical thinking while also building upon how each studio represents a thesis based on their education to date.

As the students continue through the school in the fourth and fifth years, they can work on projects in a more concentrated effort and to a higher level of development with faculty and distinguished guests who are leaders in building systems using in-house developed software tools and research, sustainability, urban design, housing, digital fabrication and design/ build. As part of these last two years of a student's education, each student can be a part of a comprehensive design studio. This comprehensive design studio can show the students the benefits of learning how to think critically and developing a strong design process during the foundation studios can aid them as they use building information modeling (BIM).

In the final year, the students are able to be self-reflective of their education and test their education in a one year-long thesis studio. The thesis is the students' chance to pose their own architectural question, site and program and to develop through their own self-guided process a solution that is a synthesis of their education here at Carnegie Mellon. In the end, each student will be able to demonstrate the knowledge gained while showing us how he or she will engage the world of our profession, integrated building and integrated practice.

Framework within the School

Mission
Promote and initiate integrated understanding of architecture, cumulative learning and understanding of other disciplines.

Design Studio Courses

48-100	Architecture Design Studio: Form	Damiani
48-105	Architecture Design Studio: Space	Cooper
48-200	Architecture Design Studio: Composition	Gutschow
48-205	Architecture Design Studio: Materials and Assembly	Gutschow
48-300	Architecture Design Studio: Site	Mondor
48-305	Architecture Design Studio: Advanced Construction	S.Lee
48-400	Architecture Design Studio: Occupancy	Akin
48-405	Architecture, Design & Systems Integration	Bartos
48-500 / 48-705	Architecture Design Studio: The Urban Laboratory	Kline / Hutzell
48-505 / 48-706	Studio X / Thesis	Hutzell / Damiani

Elective Courses

48-289 - 499	Passport	Ball - Briggs
48-576	Mapping Urbanism	Hutzell
48-577	Contemporary Middle Eastern Cities	El Samahy
48-579	Contemporary London Architecture	Ryan
48-587	Architectural Lighting Design	Limauro
48-588	Synergistic Form	Rosenblum
48-588	Contemporary Architectural Theory	Rosenblum
48-595	Under the Influence: Architecture and Art	Rosenblatt

Student Awards
Stewart L. Brown Award
Jan J. Junge Memorial Scholarship
John Knox Shear Memorial Traveling Scholarship
Louis F. Valentour A'49 Traveling Scholarship

Programs
Caste Visiting Professorship
Fifth Year End of Year Exhibit
Fitzgibbon Visiting Professor
Architecture Lecture Series
School of Architecture / School of Drama Performing Space Program
Visiting Critics, Visiting Faculty

Context and Network of Partnerships

CFA	Art; Design; Drama; Music; BHA Program; BSA Program; Studio for Creative Inquiry
CMU	College of Humanities and Social Sciences; Entertainment Technology Center
Local	Chatham University: Bachelor of Interior Architecture, B. Landscape Architecture
	Heinz Architectural Center
Regional	Ohio State University, Penn State University, Kent State University
National	ACSA; AIA; AIAS
International	5 Exchange Programs, 33 International Exchange Programs
Outreach	K-12 Architecture Explorations
Future	Master of Architecture

Strategies for **DESIGN and THESIS**

GOALS:	**Implement a Thesis studio in the final year**
Short-term	provide a final project studio
Mid-term	introduce a thesis preparation class
Long-term	have a final thesis preparation course followed by a Thesis studio

GOALS:	**Eliminate topic based studios in the first three years**
Short-term	eliminate theme names for individual studios
Mid-term	coordinate the present goals of each studio and create better connections between
Long-term	implement curriculum which builds from one semester to next, utilize talent and expertise of faculty

GOALS:	**Foster collaboration with the University**
Short-term	make connections with other schools within the University
Mid-term	develop means and processes for collaboration
Long-term	produce collaborative projects

THE FOLLOWING GOALS ARE FROM THE 2005 RETREAT:

GOALS:	**Curricular Changes / Development / Refinements / Opportunities**
Short-term	follow-through on early integration through the design sequence; exercise collective work review
Mid-term	develop assessment / measures for cumulative learning through studio sequence
Long-term	create one or more architecture courses in high demand by non-architecture students

GOALS:	**Student Development and Learning**
Short-term	integrate non-architecture interests and critics in the studio
Mid-term	develop culture of integration through attending other reviews, nurture student interests
Long-term	develop vertical studios in 4th and 5th year, develop thesis

GOALS:	**Faculty Development and Teaching** (artistic production, practice, research, scholarship)
Short-term	integrate faculty (techies and designers) through communication about ideas and resources
Mid-term	rotate faculty, provide regular faculty colloquia/workshops
Long-term	nurture / mentor new faculty

GOALS:	**School of Architecture Development** (identity, fundraising targets, promotion, visibility)
Short-term	develop interdisciplinary courses and a war room for architecture projects
Mid-term	publish work demonstrating leading model for integrated design approach
Long-term	develop national and international publicity

NEEDS:	**Human Resources**
Short-term	hire committed faculty with understanding of integrated design curriculum
Mid-term	increase faculty diversity (broadly defined)
Long-term	increase program of visiting critics

NEEDS:	**Physical** (space and equipment)
Short-term	launch architectural research repository of documents / materials / tools
Mid-term	establish shared faculty spaces, access to other department and local practices resources
Long-term	build mobile review pod; gain exposure across the campus and community

NEEDS:	**Financial Resources**
Short-term	share resources with other CMU departments
Mid-term	develop corporate foundations sponsored studios (integrated design courses)

OUTREACH / SERVICE OPPORTUNITIES:

Short-term	create program of final work exhibit through semester review
Mid-term	engage integrated design processes and practices, nationally and internationally

5.4.1 _ Design Courses

School of Architecture

Architecture	48-100	Architecture Design Studio: Form	12
Architecture	48-105	Architecture Design Studio: Space	12
Architecture	48-200	Architecture Design Studio: Composition	18
Architecture	48-205	Architecture Design Studio: Materials	18
Architecture	48-300	Architecture Design Studio: Site	18
Architecture	48-305	Architecture Design Studio: Advanced Construction	18
Architecture	48-400	Architecture Design Studio: Occupancy	18
Architecture	48-405	Architecture, Design & Systems Integration	18
Architecture	48-500 / 48-705	Architecture Design Studio: The Urban Laboratory	9
Architecture	48-505 / 48-706	Studio X	9

Carnegie Mellon University

Design	51-203	Imaging	3
Design	51-261	Communication Design Fundamentals	9
Design	51-263	Industrial Design Fundamentals	9
Design	51-271	Design History I	9
Design	51-316	Designing Spaces	9
Design	51-373	Language in Design	
Design	51-421	Introduction to Interaction and Visual Interface	9
Design	51-428	Time Motion and Communication	9
Drama	54-165	Introduction to Interaction and Visual Interface	9
Drama	54-232	Design for the Stage	9
Drama	54-252	Introduction to Lighting Design	6
Art	60-102	Concept Studio II	10
Art	60-103	Concept Studio III	10
Art	60-110	Electronic Media Studio I	10
Art	60-130	3D Media Studio I	10
Art	60-210	Electronic Media Studio II	10
Art	60-230	3D Media Studio II	10
Art	60-483	Color Studio	
CFA Inter.	62-247	Introduction to Hot Glass I	3
CFA Inter.	62-337	Studio Lighting	
CFA Inter.	62-347	Hot Glass II	3

Chatham College

217/317/417	Drawing Studio	3
222/322/422	Advanced Design and Color Theory	3
224/324/424	3/D Design Studio	3
227/327/427	Printmaking Studio	3
AR 331	Ceramics	3
LNS 511	Foundation Design Studio: Methods and Processes of Landscape Design	
LNS 512	Applied Design Studio: Principles and Practice of Landscape Design	
LNS 515	Drafting and Graphic Representation	
LNS 521	Plants and Design I	

Duquesne University

101	Design I	
120	Advanced Design	
130	Painting I	
235	Introduction to Computer Art	
245	Computer Graphic Design	
315	Relief Printmaking	
316	Intaglio Printmaking	
317	Lithography	
320	Watercolor Painting	
330	Oil Painting	
335	Advanced Computer Art	
350	Illustration Methods and Techniques	
360	Sculpture I	
365	Advanced Sculpture	
375	Computer Assisted Illustration	
385	Photography	
415	Natural History Illustration	
416	Medical Scientific Illustration	
425	Advanced Computer Imaging	
435	Advanced Computer Graphics	
445	Introduction to Multimedia	
475	Special Topics in Computer Assisted Design and Imaging	
FINAR 101	Design I	3
FINAR 103	Drawing	3
FINAR 120	Advanced Design	3
JMA 318	Advanced Web Design	
JMA 324	Principles of Audio and Video	
JMA 326	Multimedia Programming	
JMA 331	Elements of Flash	
JMA 341	Video Production: EFP/ENG	
JMA 345	Web Development Tools	
JMA 357	Streaming Media	
JMA 361	Digital Imaging Techniques	
JMA 402	Visual Design and Layout	
JMA 406	3D Modeling Principles	
JMA 407	3D Animation Principles	
JMA 409	Character Animation	
JMA 416	Foundations of Multimedia Authoring	
JMA 427	Intro to Desktop Publishing	
JMA 428	Server Side Scripting	
JMA 431	Advanced Flash Programming	
JMA 438	Gaming Essentials	
JMA 439	Game Level Design	
JMA 442	Sound Design	
JMA 463	Advanced 3D Modeling	
JMA 464	Human Computer Interaction	
JMA 475	Database for Web Development	

5.4.1 _ Design Courses (continued)

Pittsburgh Filmmakers

FM-162	Black and White Photography II
FM-164	Filmmaking I
FM-167	Introduction to the Digital
FM-200	Intermediate Filmmaking
FM-202	Color Photography I
FM-203	Color Photography II
FM-215	Video Production
	Advanced Digital Imaging
	Advanced Photo Seminar
	Animation
	Introduction to the Digital
	Black and White Photography I
	Black and White Photography III
	Computer Animation
	Flash Animation
	Film Production I
	Film Production II
	Photoshop for Photographers

Pittsburgh Glass Center

Introduction to Hot Glass I
Hot Glass II
Hot Glass III
Flameworking I
Flameworking II
Flameworking III

Robert Morris University

ARTM 1010	Foundation Studio I	3
ARTM 1011	Foundation Studio II	3
ARTM 1020	2D Design Principles	3
ARTM 1021	3D Design Principles	3
ARTM 1022	Color Theory	3
ARTM 1023	Intro to Printmaking	3
ARTM 1830	History of Visual Communications	3
ARTM 1840	History of TV and Video	3
ARTM 1850	History of Documentary Film	3
ARTM 2005	Introduction to Photography	3
ARTM 2020	Digital Imaging	3
ARTM 2110	Intro to Graphic Design	3
ARTM 2120	Vector Graphics	3
ARTM 2210	Intro to Web Design	3
ARTM 3110	Design Studio I	3
ARTM 3120	Design Studio II	3
ARTM 3130	Production for the Designer	3
ARTM 3210	HTML Toolbox	3
ARTM 3220	Coding and Scripting	3
ARTM 3430	Motion Graphics	3
ARTM 3880	Film/Video Aesthetics	3
ARTM 4110	Advanced Typography	3
COIS 6228	Advanced Graphic Design	3

University of Pittsburgh

CS 0134	Web Site Design and Development	3
CS 1520	Programming Lang for Web Applications	3
ENGLIT 0400	Introduction to Film	3
FILMST 0001	Photographic and Motion Principles	3
FILMST 0200	Black and White Photography I	3
FILMST 0530	Film Analysis	3
FILMST 0532	Introduction to Film Genres	3
SA 0110	Foundation Design	3
SA 0120	Foundation Painting	3
SA 0140	Foundation Sculpture	3

Global Education

Carnegie Mellon University

Architecture	48-576	Mapping Urbanism	9
Carnegie Institute of Technology	12-608	Implications of Engineering in a Global Society	9
Carnegie Institute of Technology	12-610	International Collaborative Construction Management	6
Computer Science and History	08-790	Technology for Developing Communities	
Heinz School	90-713	Policy and Politics: An International Perspective	12
Heinz School	90-749	Global Economy: A User's Guide	12
Heinz School	90-752	The Rise of East Asian Economies	12
Heinz School	90-763	Human Rights Policy	12
Heinz School	90-795	Technology & Policy for Disaster and Humanitarian Response	6
Heinz School	90-856	International Development	6
Humanities and Social Sciences	67-326	Global Systems and Project Management	
Humanities and Social Sciences	78-208	From Guantanamo to Baghdad and Back Again: Theory & Practice in History	9
Humanities and Social Sciences	78-258	Introduction to African History: 18th Century to Neo-Colonialism	9
Humanities and Social Sciences	78-274	War and Society in Revolutionary Europe	9
Humanities and Social Sciences	79-239	Religions of the World's Peoples	9
Humanities and Social Sciences	79-276	North of the Border: Mexican Immigration Past and Present	9
Humanities and Social Sciences	79-281	Russian History: from Communism to Capitalism	9
Humanities and Social Sciences	79-362	Law and Disorder in Early Modern Europe, 1400-1800	9
Humanities and Social Sciences	79-396	Music and Society in 19th/20th Century Europe and the U.S.	9
Humanities and Social Sciences	79-418	Literary Culture of 19th Century Russia	6
Humanities and Social Sciences	79-419	Literary Culture of 20th Century Russia	6
Humanities and Social Sciences	79-212	Disastrous Encounters	9

5.4.1 _ Interdisciplinary Education

Carnegie Mellon University

Entertainment Technology Center	60429	ETB Studio: Physical Computing: Art of Noises and High Tech Gizmos	10
CFA Interdisciplinary	62102	Modern Dance Workshop	6
CFA Interdisciplinary	62103	Modern Dance Workshop	6
CFA Interdisciplinary	62119	Greece Synthesis Project	3
CFA Interdisciplinary	62141	Black and White Photography I	9
CFA Interdisciplinary	62165	Mutable Landscape: Working from the Digital Photographic Image	9
CFA Interdisciplinary	62190	BHA/BSA Integrative Seminar	9
CFA Interdisciplinary	62205	Documentary Photography	9
CFA Interdisciplinary	62241	Black and White Photography II	9
CFA Interdisciplinary	62245	Portrait Photography	9
CFA Interdisciplinary	62247	Introduction to Hot Glass I	3
CFA Interdisciplinary	62330	Filmothea: An Interdisciplinary Film Workshop	9
CFA Interdisciplinary	62337	Studio Lighting	9
CFA Interdisciplinary	62347	Hot Glass II	3
CFA Interdisciplinary	62348	Interdisciplinary Independent Study	3,6,9,12
CFA Interdisciplinary	62358	Art and Biology	9
CFA Interdisciplinary	62360	Photographers and Photography Since World War II	9
CFA Interdisciplinary	62371	Photography, The First 100 Years	9
CFA Interdisciplinary	62381	Color Photography and Digital Output	9
CFA Interdisciplinary	62398	Interdisciplinary Independent Study: Topics in Photography	3,6,9,12
CFA Interdisciplinary	62415	Practical Web Skills	9
CFA Interdisciplinary	62446	Hot Glass III	3
CFA Interdisciplinary	62450	Flame I	3
CFA Interdisciplinary	62451	Flame II - Molding Moretti	3
CFA Interdisciplinary	62452	Flame II - Blowing Boro	3
CFA Interdisciplinary	62453	Fusing and Slumping	3
CFA Interdisciplinary	62455	Kiln Casting	3
CFA Interdisciplinary	62456	Fused and Slumped Glass-Phase II	3
Center for the Arts in Society	64100	Critical Histories of the Arts	9
Center for the Arts in Society	64347	Global Perspectives for Art	9
Center for the Arts in Society	64400	CAS Spring Fellow: Critical Discourses and Practices in Design and Art	9
Center for the Arts in Society	64401	CAS Spring Fellow: Contemporary Poetry, Poetics, and Publics	9
Center for the Arts in Society	64402	CAS Spring Fellow: Practices & Issues in Contemporary Asian Art	9
Center for the Arts in Society	64450	Stanley Kubrick and His Films	6
University-Wide Studies	99151	Privilege, Responsibility, and Community	6
University-Wide Studies	99200	Tutoring, Mentoring and Role Modeling--A Community Service Course	6
University-Wide Studies	99231	Environmental and Early Warnings	9
University-Wide Studies	99232	Urban Farming and the Environment	9
University-Wide Studies	99235	Introduction to Kosher-Halal Foods	6
University-Wide Studies	99238	Materials, Energy and Environment	9
University-Wide Studies	99241	Revolutions of Circularity	9
University-Wide Studies	99252	Seminar for Academic Counseling	4.5
University-Wide Studies	99305	The Year is 1905: E=mc2, photons and relativity	9
University-Wide Studies	99400	Interdisciplinary Undergraduate Research	3, 12
University-Wide Studies	99410	Internship	3-12,18
University-Wide Studies	99451	Building Fluency for Presentations: A class for nonnative English speakers	4.5
University-Wide Studies	99452	Language and Culture for Teaching	3

5.4.2 _ Curriculum Stream 2 _ Drawing and Media

Ultimately the test of any "media" class, analogue or digital, in an architectural school is its transfer into design work. Hand drawing contributes visualization, diagrammatic, experiential, ideographic and haptic understanding of the conceptual and three-dimensional properties of a design proposal. Model making contributes a sense of assembly, and three-dimensionality, and may in some instances accurately model surface properties. Digital media contribute a sense of sequence and assembly through animation, and model performance characteristics These understandings are vital at all points in a student's design process.

A Vision for Drawing

With the overall theme of integrating coursework into the design studio, a theme that has been an emphasis of Laura Lee's headship, there have been important advances in transferring drawing skills into the design studio in the undergraduate curriculum's first two years. Typically there have been at least three points in each of the first three semesters where there are joint requirements for "deliverables" in both drawing courses and design studios. Some of these have shown outstanding results, some less so, but an overall expectation has been set in place.

Discussion of Successes and Failures to Transfer

An important focus of the drawing courses has been the development of free-hand perspective drawing, and considerable effort has been directed at transferring this skill into design. Perspective is taught in the drawing course (see *Drawing and Perceiving*, Chapter 2) with a focus on understanding space by using a geometric x,y,z coordinate armature, and it has been this approach that has been emphasized as the agency for transfer. We believe that the single most important skill to transfer is an ability to visualize design proposals three dimensionally at whatever stage of their development

When design proposals have lent themselves to being drawn with Cartesian coordinates, when there has been an underlying sense of measurable assembly in a proposal (at whatever level in the process) and when there has been sufficient time available, then there has been a reasonable degree of transfer. Absent any of these three conditions, transfer has been weak.

Parallel to the emphasis on perspective, we have also sought transfer of color and chiarroscurro drawing skills developed in the first year and value depiction developed in the second year. Other skills have received less emphasis, and may need more. These are: composition in light, diagrammatic drawing in plan and section at the earliest design stages, and quick diagrammatic axonometric drawings.

Most critically of all, a **habit** of using drawing—drawing with care and drawing expressively, drawing fast plans and sections interchangeably with fast perspectives etc.— this kind of drawing as a habitual and central part of designing has not been established. With a few noteworthy exceptions this is true of all students independent of their drawing ability. It is this, the failure to transfer drawing as a habit that leads to the oft made observations of faculty in upper years that students cannot draw. This is the issue we need above all to address.

Drawing Central to Design: A Direction the School Should Take

Faculty teaching design (as well as those teaching drawing) need to recognize the centrality of drawing to design. This connection needs explicit and constant support within the curriculum at large and not JUST in drawing courses. Design studios at all levels need occasional design projects in which the role of drawing as part of the process is written into the problem brief (an example of such a design problem may be found in *Drawing and Perceiving* pages 66-67). Expectations of drawing might well extend beyond studios. Architectural History courses might offer instruction on drawn note taking and then require sketchbooks as part of the course requirements. Effectively, all faculty need to become drawing teachers, not in the sense of instruction, but in the sense of holding students accountable for effective and expressive use of drawing as a matter of course. We have the foundation in place to make sure that students still draw well: something that will truly distinguish us from other schools if the comments of so many practitioners out there in the field are to be believed.

Framework within the School

Mission
Cultivate an atmosphere of appreciation and respect for analog and digital media.

Required Courses		
48-120	Introduction to Digital Media I	Burns
48-125	Introduction to Digital Media II (+ 3 lab sessions)	Burns
48-130 / 48-132	Architectural Drawing I: A Tactile Foundation	Cooper
48-135 / 48-137	Architectural Drawing II: Appearance	Cooper
48-230 / 48-232	Architectural Drawing III: Perspective	Cooper
Elective Courses		
48-355	Drawing Elective	Suhrbier
48-477	Patterning: Third Generation Digital Design	Burns
48-560	Computer Modeling III	Krishnamurti
48-570	Parametric Design (Maya / Rhino / RP)	Burns
Student Awards	The Burdett Assistantship	
B Arch 5 + 1	Master of Science in Computational Design	
Programs	CoDe (Computational Design) Lab	
	Castcon Second Year Design Competition	
	NCMA Second Year Design Competition	
	Velux Second Year Design Competition	
	Epic Metals Third Year Design Competition	
	International Murals by Doug Cooper involving CMU students	

Context and Network of Partnerships

CFA	Art; Design; Studio for Creative Inquiry
CMU	Entertainment Technology Center
	School of Computer Science (Human Computer Interaction Institute, Robotics)
Local	Pittsburgh Glass Center; Pittsburgh Filmmakers
	Digital Greenhouse; Redstar Ironworks; Fabricators
	Carnegie Museum of Art; Children's Museum; Mattress Factory
National	ACADIA; ACSA; AIA; AIAS; Design Communication Association
International	Canadian Center for Architecture; ECAADE
Future	Materials Library, Media Lab

Strategies for **DRAWING and MEDIA**

GOALS:	**Curricular Changes / Development / Refinements / Opportunities**
Short-term	develop media mini courses, seminars, workshops for technical / media development
Mid-term	integrate media through facilities and collaborative industry relationships

GOALS:	**Student Development and Learning**
Short-term	develop students understanding of the integrity of each medium; fluid use for time and place
Mid-term	increase opportunities for cross-disciplinary courses (graphic design, painting, typography, etc)

GOALS:	**Faculty Development and Teaching** (artistic production, practice, research, scholarship)
Short-term	provide faculty to faculty analog (modeling) and digital (software) workshops

GOALS:	**School of Architecture Development** (identity, fundraising targets, promotion, visibility)
Short-term	develop template and require digital portfolio from every student at the end of each semester
Mid-term	establish system for online analog and digital student work for archive and print documents
Long-term	establish yearly student journal

NEEDS:	**Human Resources**
Short-term	train students for new “materials workshop”
Mid-term	attract high-profile guest faculty for mini courses, seminars, workshops

NEEDS:	**Physical** (space and equipment)
Short-term	increase public display of student work in all media
Mid-term	establish devoted latest technology / rapid prototyping to include all materials
Long-term	provide staging or exhibit space for large scale production

NEEDS:	**Financial Resources**
Short-term	identify grants / professional affiliations for funding
Mid-term	engage fabricators for on-site, hands-on workshops

OUTREACH / SERVICE OPPORTUNITIES:

Mid-term offer courses and workshops as continuing education for local professionals

5.4.2 _ Drawing and Media Courses

School of Architecture

Architecture	48-120	Introduction to Digital Media I	9
Architecture	48-125	Introduction to Digital Media II (+ 3 lab sessions)	6
Architecture	48-130 / 48-132	Architectural Drawing I: A Tactile Foundation	6
Architecture	48-135 / 48-137	Architectural Drawing II: Appearance	9
Architecture	48-230 / 48-232	Architectural Drawing III: Perspective	9
Architecture	48-355	Drawing Elective	
Architecture	48-477	Patterning: Third Generation Digital Design	24
Architecture	48-560	Computer Modeling III	9
Architecture	48-570	Parametric Design (Maya / Rhino / RP)	

Carnegie Mellon University

Art	60-102	Concept Studio II	10
Art	60-103	Concept Studio III	10
Art	60-110	Electronic Media Studio I	10
Art	60-130	3D Media Studio I	10
Art	60-230	3D Media Studio II	10
Art	60-210	Electronic Media Studio II	10
Art	60-483	Color Studio	
Design	51-203	Imaging	3
Drama	54-165	Introduction to Sound Design for Theater	6
Drama	54-237	Introduction to Scene Painting	6
Drama	54-252	Introduction to Lighting Design	6
Drama	54-447	Figure Drawing	4
Music	57-102	Finale	6
English	76-238	Introduction to Media Studies	
English	76-338	The American Cinema	
English	76-339	Advanced Studies in Media	9
English	76-382	Multimedia Authoring I	9
English	76-382	Multimedia Authoring II	9

Carlow College

AR 227	Painting I	3
AR 315	Sculpture	3
AR 317	Painting II	3
AR 321	Printmaking	3
AR 330	Advanced Projects in Art/Art History	3
AR 331	Ceramics	3
AR 355	Introduction to Computer Art	3

Chatham College

105	Sculpture I	3
111	Ceramics I	3
115	Painting I	3
117	Drawing I	3
124	3-D Design I	3
127	Printmaking I	3
135	2-D Design I	3
141	media Literacy	3
151	Media Analysis: Text	3
161	Introduction to Film, Video and New Media Art	3
200	2-D and 3-D Design	3
210	Drafting and Graphics	3
215	Computer Design Technology	3
247	Digital Photography and Restoration	3
250	Introduction to Digital Video Production	3
265	Interactive Strategies	3
273	Photography I	3
277	Media Analysis: Context	3
300	Critical Theory	3
310	Advanced Computer Design	3
350	Intermediate Digital Video Production	3
353	Print Design	3
357	Photography II	3
388	Landscape Photography	3
415	Drafting and Graphic Representation	3
421	Digital Animation and Compositing	3
450	Adv. Digital Video Production Studio	3
471	Advanced E-Merging Media Studio	3

Duquesne University

101	Design I
103	Drawing
120	Advanced Design
130	Painting I
203	Figure Drawing
230	Advanced Printing
235	Introduction to Computer Art
245	Computer Graphic Design
315	Relief Printmaking
316	Intaglio Printmaking
317	Lithography
320	Watercolor Painting
330	Oil Painting
335	Advanced Computer Art
350	Illustration Methods and Techniques
360	Sculpture I
365	Advanced Sculpture
375	Computer Assisted Illustration
385	Photography
415	Natural History Illustration
416	Medical and Scientific Illustration
425	Advanced Computer Imaging
435	Advanced Computer Graphics
475	Special Topics in CAD and Imaging
JMA 226	Introduction to Web Design and Development
JMA 240	Media and Society
JMA 241	Video Production: Studio

5.4.2 _ Drawing and Media Courses (continued)

Duquesne University (continued)

JMA 260	New Media Production	
JMA 282	Photojournalism: Digital Imaging	
JMA 304	Media History	
JMA 308	Interface Design	
FINAR 130	Painting I	3
FINAR 203	Figure Drawing	3
FINAR 235	Introduction to Computer Art	3
FINAR 245	Computer Graphic Design	3
FINAR 315	Relief Printmaking	3
FINAR 316	Intaglio Printmaking	3
FINAR 317	Lithography	3
FINAR 320	Watercolor Painting	
FINAR 330	Oil Painting	3
FINAR 335	Advanced Computer Art	3
FINAR 350	Illustration Methods and Techniques	3
FINAR 360	Sculpture I	3
FINAR 365	Advanced Sculpture	3
FINAR 375	Computer Assisted Illustration	3
FINAR 385	Photography	3
FINAR 445	Introduction to Multimedia	3
JMA 226	Introduction to Web Design and Development	3
JMA 308	Interface Design	3
JMA 442	Sound Design	3

Pittsburgh Filmmakers Institute

Black and White Photography I
Black and White Photography II
Color Photography
Photographic and Motion Principles
Film Production
Lighting for Film and Video

Pittsburgh Glass Center

Introduction to Hot Glass
Flameworking I
Beginner Beadmaking
Metal and Moretti
The Art of Stained Glass
Mosaic Madness
Introduction to Fusing and Slumping
Introduction to Kiln Casting

Point Park University

ACC 308	Advanced Desktop Design and Publishing	
CINE 150	Production I	
CINE 325	Intermediate Digital Tools	
CINE 420	Advanced Editing/Sound	
CMPS 320	Web Design and Development	
CMPS 321	User Interface Design and Development	
DRFT 202	Electrical and Electronic Drawing	

Robert Morris University

ARTM 1020	2D Design Principals	
ARTM 1021	3D Design Principals	
ARTM 1023	Intro to Printmaking	
ARTM 2005	Intro to Photography	
ARTM 3110	Design Studio I	
ARTM 3140	Corporate Identity Design	
COIS 6226	Information Design	

University of Pittsburgh

FILMST 0200	Black and White Photography	3
FILMST 0220	Color Photography I	3
FILMST 1157	Lighting for Film and Video	3
SA 0110	Foundation Design	3
SA 0120	Foundation Painting	3
SA 0130	Foundation Drawing	3
SA 0140	Foundation Sculpture	3
SA 1430	Perspective Drawing	3
THEA 0840	Introduction to Theater Design	3
THEA 0842	Introduction to Stagecraft	3
THEA 1227	Scene Painting	3
THEA 1230	Stage Lighting	3
THEA 1240	Costume Crafts	3
1373	Design for Film	3
250	Introduction to Digital Video Production	3
265	Interactive Strategies	3
273	Photography I	3
277	Media Analysis: Context	3
300	Critical Theory	3
310	Advanced Computer Design	3
350	Intermediate Digital Video Production	3
353	Print Design	3
357	Photography II	3
388	Landscape Photography	3
415	Drafting and Graphic Representation	3
421	Digital Animation and Compositing	3
450	Adv. Digital Video Production Studio	3
471	Advanced E-Merging Media Studio	3

5.4.3 _ Curriculum Stream 3 _ Architectural History

Mission

* To educate students to bring a questioning, critical, and informed "mind's eye" to the world
* To educate students to see historically ,and to recognize the hand of the past both on its own terms and as a context that enriches current practice and theory
* To understand architecture as a humanistic act, influencing and influenced by culture
* To educate students to be able to research questions they pose, and to be able to communicate their findings
* To increase reading, researching, traveling, recording, reporting, and writing throughout the curriculum
* To complement, supplement, broaden, and challenge a student's architectural training with the historical and cultural perspective
* To improve each student's architectural literacy and hence awareness and performance across the architectural curriculum

Direction

1. Move history survey to 1 year - introduce skills and knowledge base earlier
2. Hire an additional tenure-track architectural historian - create depth, breadth, and coherence in architectural history stream, possibility of expanding history AND theory electives, reduce adjunct scramble
3. Increase "Study Abroad" programs with architectural history focus
4. Increase flexibility and number of Study Abroad programs, such as the two-week "Study trips" or two- week "Field Measuring" trips
5. Look for opportunities to formalize cross-SoA interactions via collaborative teaching or develop co- requisites

Needs

1. Funding for additional tenure-track position in History or History/Theory
2. Funding for short & long term study abroad programs, including faculty salaries and student aid
3. Funding for short-term team-teaching or guest-speaking SoA faculty crossing the curriculum

Framework Within the School

Core of 3 Required Courses in Architectural History, plus prerequisite of Arts Histories
Students may fulfill requirements any semester after the History Survey course
Core 3 must be taken within School of Architecture

Required Courses

48-240 / 79-227	Arch History I: Survey World Arch + Urbanism	Shaw

Selective Courses

48-343 / 79-471	The American Built Environment Since 1860	Shaw
48-348	Architecture of Central & South America	Shaw
48-440	American Regionalism	Shaw
48-447	History and Preservation	Shaw
48-340	Modern Architecture and Theory 1900-1945	Gutschow
48-341	History of Architectural Theory	Gutschow
48-441	Frank Lloyd Wright & Modern Architecture	Gutschow
48-344	Architecture of Henry Hornbostel	Rosenblum
48-448	History of Sustainable Architecture	Rosenblum
48-433	Destruction and Rebuilding of Iconic Buildings and Cities	Coohill
48-338	European Cities in the XIX Century	Torello

Faculty
1 tenured faculty, teaching 4 histories a year
1 tenure-track faculty, teaching 2 histories a year
2-3 adjunct faculty, teaching approx. 4 histories a year total

Context and Network of Partnerships

Programs	Information Literacy Grant through University Libraries Study Abroad: Open Exchanges and Opportunities in the 4th Year Summer Study Abroad program with School of Architecture
Study Abroad	typically includes architectural history elective beyond the Core 3
Student Awards	Pittsburgh History and Landmarks Book Prize, writing award Ferguson Jacobs Prize, research support

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CFA	Architecture Archives and Library; BHA Program; Center for Arts in Society
CMU	College of Humanities and Social Sciences (Department of History) University Libraries
Local	Carnegie Museum of Art; Heinz Architectural Center Pittsburgh History and Landmarks Foundation [PHLF] City of Pittsburgh Preservation Planning in Urban Planning department University of Pittsburgh Department of Architectural and Art History
Regional	Historic Society of Western Pennsylvania [HSWP] Pennsylvania Historic Monuments Commission [PHMC] (Harrisburg) Young Preservationists Association [YPA] Western Pennsylvania Nature Conservancy, Fallingwater
National	Society for Architectural Historians [SAH] Vernacular Architecture Forum [VHF] Historic American Buildings Survey [HABS] Historic American Engineering Record [HAER] National Trust for Historic Preservation [NTHP] Taliesien & Frank Lloyd Wright Foundation
International	EPFL, Lausanne, Switzerland ITESM faculty exchanges; Oxford University; Yorkshire Forward National University of Singapore
Future	Integrated historic preservation course and studio

Strategies for **HISTORY: Retreat 2005**

GOALS:	**Curricular Changes / Development / Refinements / Opportunities**
Short-term	increase required courses in the history of the built environment
Mid-tern	establish CFA Arts Histories (History of Art and Culture course) and expand survey to 2 semesters
Long-term	include history content in all curricular streams (drawing, design, practice, technology) to

GOALS:	**Student Development and Learning**
Short-term	institute more reading, writing, traveling, recording, reporting throughout the curriculum
Mid-term	develop better quality student "products" that merit a web / publishing / dissemination project or prize worthy

GOALS:	**Faculty Development and Teaching** (research, scholarship)
Short-term	integration (meetings) among the architectural historians
Mid-term	integration of faculty and courses in CFA and ultimately CMU
Long-term	lower faculty/student ratios that enable closer teaching contact hours sabbatical leaves are especially important for historians, as research can NOT be done on campus, work tends to be individual (rather than team-based), and writing more extensive for more focus-time

GOALS:	**School of Architecture Development** (identity, fundraising targets, promotion, visibility)
Short-term	offer more history oriented prizes – including lectures, travel scholarships slide digitization project ? funding? staff-person?
Mid-term	offer more history in the summer abroad programs, increase the international opportunities
Long-term	provide visiting chairs in architectural history

NEEDS:	**Human Resources**
Short-term	hire more historians representing specialties other than currently those represented on faculty
Mid-term	hire more and appropriate teaching and research assistants for the history faculty and courses
Long-term	hire another tenure-track architectural historian

NEEDS:	**Physical** (space and equipment)
Short-term	room improvements for effective lectures: screens, blinds, dimming switches, projection, etc.
Mid-term	strategic plan and funding to go digital – one course at a time

NEEDS:	**Financial Resources**
Short-term	Funding for slide digitization project
Long-term	endow chairs in architectural history

OUTREACH / SERVICE OPPORTUNITIES:

Short-term	local education and preservation projects

5.4.3 _ History Courses

School of Architecture

Architecture	48-240 / 79-227	Arch History I: Survey World Arch + Urbanism
Architecture	48-343 / 79-471	The American Built Environment Since 1860
Architecture	48-348	Architecture of Central & South America
Architecture	48-440	American Regionalism
Architecture	48-447	History and Preservation
Architecture	48-340	Modern Architecture and Theory 1900-1945
Architecture	48-341	History of Architectural Theory
Architecture	48-441	Frank Lloyd Wright & Modern Architecture
Architecture	48-344	Architecture of Henry Hornbostel
Architecture	48-448	History of Sustainable Architecture
Architecture	48-433	The Destruction and Rebuilding of Iconic Buildings and Cities
Architecture	48-338	European Cities in the XIX Century
Architecture	48-240 / 79-227	Arch History I: Survey World Arch + Urbanism
Architecture	48-343 / 79-471	The American Built Environment Since 1860
Architecture	48-348	Architecture of Central & South America
Architecture	48-440	American Regionalism

Carnegie Mellon University

Design	51-174	History of Objects and Images
Design	51-372	Contemporary Design
Drama	54-239	History of Architecture and Décor
Drama	54-240	History of Architecture and Décor
Drama	54-245	History of Clothing
Music	57-173	Survey of Western Music History
Music	57-204	18th and 19th Century Music History
Music	57-205	20th Century Music History
Music	57-485	1920s and 1930s: Perspectives on Arts
Art	60-350	Art History/Theory Special Topics
English	76-101	Designated Writing
English	76-355	The Rhetoric of Making a Difference
English	76-373	Topics in Rhetoric: Argument
English	76-381	Contemporary Rhetorical Theory
English	76-386	Language and Culture
English	76-392	Rhetoric and Public Policy
History	79-104	Introduction to World History
History	79-243	A History of American Urban Life
History	79-244	Pittsburgh and the Transformation of Modern America
History	79-308	The Politics and Culture of Memory
History	79-324	Modern Painting
History	79-345	American Environmental History
History	79-348	Objects of Value
History	79-355	The American Skyscraper
History	79-364	Art, Anthropology and Empire

Carlow College

AR 101	Introduction to Art/Visual Culture I	3
AR 102	Introduction to Art/Visual Culture II	3
AR 245	Heritage of American Art	3
AR 249	American Art of Our Century	3
AR 266	Art of Our Century	
EN 331	Critical Writing	3
HS 207	History of the American City	3

Chatham College

131	History of World Art I: Pre-History to 1400	3
132	History of World Art II: 1400 to the Present	3
210	Italy: The Science of Art	3
220	France: The Growth of a Nation	3
231	Renaissance Art	3
248	19h Century Art	3
250	History of Interior Architecture: Prehistory to the 20th Century	3
254	Modern Art, 1890-1950	3
257	20th and 21st Century Architecture	3
263	Women and Art	3
271	Asian Art	3
316	Japanese Prints: Technique and History	3
338	Impressionism	3
340	History, Art, and Literature of London	3
366	American Art: Colonial to 1900	3
372	African Art	3
431	Survey of the History of Landscape Design	3
LAR 520	Prehistory of Landscape Architecture; 15th-18th Century	
LAR 521	North American Landscape History	

Community College of Allegheny County

ART-145	Women in Art/Exp	3
ART-260	European Art/Architecture	3

Duquesne University

111	History of Art: Ancient to Medieval World	3
112	History of Art: Renaissance to Modern World	3
150	Shaping of the Ancient World	
206	Greek Art	3
207	Roman Art	3
210	American Art	3
220	History of Photography	3
312	Late Medieval Art	3
321	15th Century Renaissance Art	3
331	Art of the Nineteenth Century	3
332	Art of the Twentieth Century	3
374	Michelangelo: His Art and His World	3
376	Contemporary Art	3
398	Art and Society	3
441	American Paintings and Sculpture	3
443	American Decorative Arts	3
541	American Painting and Sculpture	3
542	American Architecture	3
543	American Decorative Arts	3
	Special Studies in Art History	3
HISTY 311W	Writing History	
THEA 210	History of Theater	3

La Roche College

AH/ID 239	History of Int. Design and Architecture II	3
ID/FA 232	History of Int. Design and Architecture I	3
ID/FA 332	History of Int. Design and Architecture III	3

5.4.3 _ History Courses (continued)

Pittsburgh Filmmakers

History of Photography II

Point Park University

ART 100	Introduction to the Visual Arts	3
ART 210	Introduction to Architecture	3
ART 301	Ancient Art	3
ART 302	Medieval Art	3
ART 304	Renaissance and Baroque Art	3
ART 306	American Art	3
THEA 217	Period Styles I	3
THEA 218	Period Styles II	3

Robert Morris University

ARTM 1830	History of Visual Communications	3
ARTM 1840	History of TV and Video	3
ARTM 1850	History of Documentary Film	3

University of Pittsburgh

ANTH 1530	Origins of Cities	3
HAA 0010	Introduction to Art	3
HAA 0040	Introduction to Architecture	3
HAA 0041	Introduction to Architecture/Writing	3
HAA 0050	Introduction to Medieval Art	3
HAA 0100	Special topics-Ancient Cities	3
HAA 0440	Frank Lloyd Wright	3
HAA 0480	Modern Architecture	3
HAA 1010	Approaches to Art History	3
HAA 1235	English Medieval Architecture	3
HAA 1240	Romanesque Architecture	3
HAA 1305	Early Renaissance Architecture	3
HAA 1306	High Renaissance Architecture	3
HAA 1630	History of Chinese Architecture	3
HAA 1910	Special Topics-Architecture	3
0010	Greek Civilization	
0020	Roman Civilization	
0030	Introduction to Modern Art	
0221	Medieval Architecture	
0420	Writing for the Public	
0444	Urban Sociology	
1100	Greek Architecture	
1531	Man & Cosmos in the Renaissance	
1665	The History of the American City	
1880	World Cities	

Theory and Criticism Courses

School of Architecture

Architecture	48-289 - 499	Passport	9
Architecture	48-576	Mapping Urbanism	9
Architecture	48-577	Contemporary Middle Eastern Cities	9
Architecture	48-579	Contemporary London Architecture	1.5
Architecture	48-587	Architectural Lighting Design	9
Architecture	48-588	Synergistic Form	9
Architecture	48-588	Contemporary Architectural Theory	9
Architecture	48-595	Under the Influence: Architecture and Art	9

Carnegie Mellon University

Design	51-174	History of Objects and Images	9
Design	51-372	Contemporary Design	
Design	51-373	Language in Design	
Drama	54-171	Human Experience in Design	9
Music	57-485	1920s and 1930s: Perspectives on Arts	
Art	60-350 / 60-398	Art History/Theory Special Topics	
English	76-101	Designated Writing	9
English	76-355	The Rhetoric of Making a Difference	
English	76-373	Topics in Rhetoric: Argument	9
English	76-381	Contemporary Rhetorical Theory	
English	76-386	Language and Culture	9
English	76-392	Rhetoric and Public Policy	
History	79-243	A History of American Urban Life	9
History	79-308	The Politics and Culture of Memory	
History	79-348	Objects of Value	
History	79-364	Art, Anthropology and Empire	
Philosophy	80-150	Nature of Reason	9
Philosophy	80-181	Language and Thought	9
Philosophy	80-230	Ethical Theory	9
Philosophy	80-235	Political Philosophy	9
Philosophy	80-270	Philosophy of Mind	9
Philosophy	80-321	Causation and Social Policy	9
Philosophy	80-340	Environmental Ethics and Decision Processes	
Philosophy	80-344	Environmental Ethics	

Carlow College

AR 101	Introduction to Art/Visual Culture I	3
AR 102	Introduction to Art/Visual Culture II	3
AR 268	Contemporary Art Issues	3
EN 331	Critical Writing	3

Chatham College

210	Italy: The Science of Art	3
220	France: The Growth of a Nation	3
263	Women and Art	3
271	Asian Art	3
308	Museum Studies & Art Gallery Practicum	3
ENV 525	Environmental Policy	

Duquesne University

398	Art and Society	3

Robert Morris University

ARTM 1830	History of Visual Communications	3

University of Pittsburgh

HAA 1010	Approaches to Art History	3
HAA 1040	History of Architecture Theory	3
0010	Concepts of Human Nature	3
0354	Words and Images	3
0420	Writing for the Public	3
0444	Urban Sociology	3
1531	Man & Cosmos in the Renaissance	3
2011	Issues in Cultural Studies	3

5.4.4 _ Curriculum Stream 4 _ Building Technology

Traditional undergraduate architectural curricula have tended to separate building technology courses - which introduce fundamental knowledge - from studio courses, which focus on synthetic skills. A cursory review of university catalogs available on the World Wide Web reinforces this perception. The majority of curricula are studio oriented and those studios have ill-defined or non-existent thematic descriptions such as Design I, Design II, etc. The catalogs indicate the traditional technology courses including construction, structure and mechanical systems exist as islands onto themselves.

These courses are taught by a different group of faculty and there exist no explicit linkages between these courses and the studios that are being taught simultaneously. The credit hours for studio dominate the credit hours for the curriculum and not surprisingly, students invest their time and energy in the studios at the expense of the "other" courses.

The curriculum at Carnegie Mellon University describes a very explicit pedagogical model for the conduct of its design studios. The studios of each semester have a common theme with direct linkages to pre-requisite and co-requisite courses within the curriculum. The themes of the ten studios at CMU range from experiments in building design with computer modeling and wood shop to urban design and architecture in the urban context. The complementary course sequences fall thematically in the following areas: engineering, building science, design science, and architectural history and theory.

The envisioned structure for the curriculum is divided into two phases - foundations (first three years) and specialization (last two years). The building technology course sequence is part of the foundations phase, beginning with physics and proceeding through statics, structures, materials, construction and site engineering. Simultaneous, the studio sequence is allowing students to synthetically investigate issues of building technology at increasing levels of complexity, from the first year shop projects to the second year installation to the site and advanced construction studios.

Currently, students wishing to focus on design/ build in the specialization phase, the Solar Decathlon project is offered every two years. Over a two year period of time, an 800 square foot solar house is built in Pittsburgh and then deployed on the National Mall in Washington, DC for the Solar Decathlon competition. Contest rules required that each house generate enough energy to operate a household, a home–based business and related transportation needs. The team that compiles the most points over the ten contests is declared the overall winner, but significant recognition is given to the winners of the ten individual contests in categories ranging from energy balance to transportation to design and livability. At the conclusion of the competition, Carnegie Mellon donates its house to a local non-profit organization.

The Solar Decathlon competition directly addresses the educational mission of Carnegie Mellon. Competing in a prominent international student competition and placing a student–built structure as an educational resource dedicated to environmental issues is symbolic of everything Carnegie Mellon stands for – fusing art and technology, collaborating on a multi–disciplinary basis, improving energy effectiveness and environmental responsibility, learning in a hands–on fashion and impacting regional and global issues. The project has made a major positive impact on all the participants – the students and trade workers that were and are currently involved will become the future leaders that help us create a sustainable world.

For those students wishing to pursue more advanced understandings of building technology, or “making”, we are developing a vertically integrated specialization sequence focusing on a neighborhood design/ build experience. This studio sequence with allow students to develop understandings of urban design and community-participatory design in addition to the experiential learning coming from construction at full scale of a building that they have designed.

The relationship of design and building technology, in both studio and technology classes, emphasizes the importance of this topic and allows the student multiple ways of accessing the knowledge. With its introduction at the foundations phase of the curriculum, the students learn that technology is not something to be done by others but is a fundamental way of conceptualizing and exploring architectural design.

The common themes and integration with studio for the building technology sequence creates the following outcomes:
creates an explicit focus for the studio so that subsequent studios can rely upon the fact that specific material has been covered;
facilitates the application of knowledge gained in one class to the studio activities;
encourages the students to work with their peers and allows the students to see alternative approaches to the same problem;

Framework within the School

Mission
Provide an architectural framework of critical thinking and decision-making skills to enable the technical competency and appropriate assembly of built objects. The integration of fundamentals, applications and synthesis will enable continuous adaptability and innovation.

Required Courses

48-115	Physics for Architecture (plus recitation)	Reid
48-210	Statics	Oppenheim
48-215	Materials and Assembly	S. Lee
48-217	Structures	Oppenheim

Elective Courses

48-456 / 12-605	Design and Construction with CIT	Cartwright
48-474	Digital Fabrication Lab Construction	Ficca
48-513	Digital Fabrication: How to Make Things	Gross
48-570	Making Furniture Interactive	Gross
48-787	Architectural Robotics	Gross
48-520	Home 2020	Do/Gross
48-564	Design-Build Shop Elective	Smith/Boykowycz
48-564	Design-Build Shop Elective	Smith
48-565	Exploration in Design and Construction of Practical Objects	
48-565	Model Making In Wood: Barns of W PA	Smith

Student Awards — Richard M. Gensert Memorial Award for Structures

Programs — Design / Build with Civil Engineering [Larry Cartwright]

Other Opportunities — Carnival Booth

Context and Network of Partnerships

CFA
School of Art
School of Design [Industrial Design]

CMU
Carnegie Institute of Technology [Engineering]

Local
Community Design Center of Pittsburgh
Pittsburgh Builders Guild (Carpenters, Masons, Ironworkers)
Master Builders Association
Society for Contemporary Craft
Art Institute of Pittsburgh
University of Pittsburgh School of Engineering
Mascaro Sustainability Institute

Regional
Penn State Department of Architectural Engineering

National
Ford Motor Company
TRACO; Hardware Manufacturers Association
Construction Companies: P J Dick, Mascaro, Mosites, Turner
Follansbee Steel

International
Alcoa, Bayer Material Science, PPG, TU-Darmstadt

Outreach
Habitat for Humanity

Strategies for **BUILDING TECHNOLOGY**

GOALS:	**Curricular Changes / Development / Refinements / Opportunities**
Short-term	expand focus beyond wood to include other materials in the first year studios
Mid-term	expand hands-on opportunities in the second year studios
	formalize vertically integrated Design/ Build in fourth and fifth years
Long-term	revise the advanced construction third year studio to provide a greater focus on building enclosures

GOALS:	**Student Development and Learning**
Short-term	transition from "formal structure" to "tectonic structures" 1st year → 2nd year
Mid-term	transition from "concept" → "tectonic"
	provide opportunities for both analogue and digital fabrication
Long-term	require design build experiences throughout first three years of the curriculum

GOALS:	**Faculty Development and Teaching** (artistic production, practice, research, scholarship)
Mid-term	more faculty – junior faculty on the tenure track

GOALS:	**School of Architecture Development** (identity, fundraising targets, promotion, visibility)
Short-term	furniture show, expand show to PCA, SCC, Miller Gallery
Mid-term	materials and enclosure lab
Long-term	The Neighborhood Studio (Pittsburgh equivalent of Rural Studio)

NEEDS:	**Human Resources**
Short-term	additional faculty for shop/building activities
	materials engineering person

NEEDS:	**Physical** (space and equipment)
Short-term	enhanced shop facilities for more materials – 4x current sq-ft
	enhanced shop lab/ work space (distributed – accessible to every year)
	mobile shop for design/ build including storage space
Mid-term	permanent materials and enclosure lab
	acquire warehouse for construction/ prototyping activities

NEEDS:	**Financial Resources**
Short-term	involve tool manufacturers
Mid-term	involve material suppliers
Long-term	involve construction companies

OUTREACH / SERVICE OPPORTUNITIES:	
Short-term	support Community Design Center of Pittsburgh, Habitat for Humanity
	support individual neighborhood CBO's

5.4.4 _ Building Technology Courses

School of Architecture

Architecture	48-115	Physics for Architecture (plus recitation)	9
Architecture	48-210	Statics	9
Architecture	48-215	Materials and Assembly	9
Architecture	48-217	Structures	9

Carnegie Mellon University

Math	21-120	Differential and Integral Calculus	
Civil Eng.	12-271	Introduction to Computer App. In Civil and Environmental Eng.	9
Civil Eng.	12-331	Solid Mechanics	9
Civil Eng.	12-358	Materials Lab	3
Civil Eng.	12-401	Civil and Environmental Engineering Design	15
Civil Eng.	12-611	Project Management Construction	9
EPP	19-424	Energy and the Environment	9
EPP	19-426	Environmental Decision Making	
EPP	19-440	Combustion and Air Pollution Control	

Chatham College

220	Interior Architecture I	3
225	Interior Architecture II	3
315	Construction Documents	3
320	Interior Architecture III	6
325	Interior Architecture IV	6
335	Lighting and Acoustics	3
LAR 650	Construction I: Grading and Landforms	4
LAR 534	Soil Sciences	3
LAR 651	Construction II: Materials and Methods	
LAR 656	Community Field Work: Site Internship	

Point Park University

CET 205	Introduction to Surveying	3
CET 212	Properties of Materials	3
CET 213	Strength of Materials	3
CET 214	Strength of Materials Laboratory	1
ENGR 1010	Intro to Engineering	3
ENGR 1610	Statics and Strength of Materials	3
ENGR 2180	Engineering Materials	3
ENGR 3210	Fundamentals of Logistics Engineering	3
ENGR 3680	Intro to Quality Engineering	3

University of Pittsburgh

1050	Product Realization	
1200	Construction Management	
CEE 0109	Computer Methods in Civil Eng. I	3
CEE 0119	Computer Methods in Civil Eng. II	3
CEE 1102	Probability Concepts in Civil and Environmental Engineering	3
CEE 1105	Materials of Construction	3
CEE 1200	Construction Management	
CEE 1211	Resource Use and Environmental Quality in Construction	3
CEE 1330	Introduction to Structural Analysis	4
CEE 1331	Matrix Structural Analysis	3
CEE 1333	Structural Design Project	3
CEE 1340	Concrete Structures I	3
CEE 1341	Steel Structures I	3
CEE 1402	Fluid Mechanics	4
CEE 1503	Introduction to Environmental Engineering	3
CEE 1811	Principles of Soil Mechanics	4
ENGR 0022	Materials Structure and Properties	3
ENGR 0131	Statics for Civil and Environmental Engineers	3
ENGR 0141	Mechanics of materials for Civil and Environmental Engineers	3
ENGR 0151	Dynamics for Civil and Environmental Engineers	3

5.4.5 _ Curricular Stream 5 _ Environmental Technology

Mission
Educate future leaders to design for environmental regeneration through multi-disciplinary knowledge and integrated practice towards a globally shared quality of life.

Integration of design and building technologies, community development design, history, urban systems, and environmental science, human health, and the triple bottom line. PEOPLE PLANET PROFIT

- Immersive
- Integrating research and practice
- Systems thinking / interdisciplinary in nature
- Participatory in process (from beginning of the process
- Design for continuum of time and scale

Faculty Strengths 2007
6 full time faculty/researchers: Volker Hartkopf PhD, Vivian Loftness FAIA/LEEDAP, Stephen Lee AIA/LEEDAP, Khee Poh Lam RIBA/PhD, Azizan Aziz LEEDAP, David Archer PhD
6 adjunct and studio faculty: Christine Mondor LEEDAP, Gerry Mattern PE, Jeff Davis LEEDAP, Kevin Gannon LEEDAP Rebecca Flora LEEDAP, Kent Suhrbier LEEDAP
15 MS and PhD students in Building Performance and Diagnostics
5-15 MS in Sustainable Design annually

State of the School: The Carnegie Mellon School of Architecture has an international reputation as a leading research and educational center for sustainable design, attracting excellent graduate students and unmatched federal, industrial and international funding. The commitment of the school to ensure that the strengths of the graduate research is integral to undergraduate education has not only placed leading faculty in required courses but created unique and outstanding elective courses. The presence of leading environmental practitioners in our design studios ensures that quantitative learning is translated into design and practice. The Intelligent Workplace continues to be the only 'living laboratory' of its kind in the US, and has led to the creation of similar research and teaching labs in Paris and China. CMU is one of only 4?US schools that has entered in the Solar Decathlon national design competition in all three events, ensuring that a significant number of our graduates can practice sustainability immediately upon graduation. In addition, Carnegie Mellon has placed environmental sustainability as a strategic direction for its educational, research and facility growth agenda – supporting the slow creation of a truly multi-disciplinary curriculum that is further enhanced by alliances with other Pittsburgh campuses. Finally, the CMU School of Architecture is privileged to be located in the city of Pittsburgh, with its multiple main street neighborhoods and its prize-winning commitment to green buildings.

Vision
The School of Architecture intends to make Environment: Sustainability ubiquitous in the Bachelor of Architecture curriculum, bringing: fundamentals and experiential learning to the early design studios, focused and in-depth expertise to the third and fourth year, and ensuring demonstrated design expertise in upper level studios. In addition, the School intends to ensure environmental leadership by CMU graduates in future practice through upper level theses, an immersion in research by first professional degree students, 5+1 degrees, and post professional degrees in Sustainable Design.

All CMU BArch and MSSD graduates will demonstrate in their designs:

- Scales of design decision-making for environmental sustainability,
  eg 'Powers of 10' from watersheds and airsheds to regions to communities to buildings to materials.
- Integrated design for environmental sustainability,
  Inter-disciplinary decision-making in the design professions, expanding BIM
  Trans-disciplinary with social, environmental, scientific, and health research
- Positive and normative research in practice
- Of place / context / regionalism
- Regenerative, environmentally proactive design as invention/innovation.

Framework within the School

Required Courses		
48-312 / 317	Site Engineering and Foundations	Mondor
48-315	Environment I: Climate and Energy	Loftness
48-410 / 48-726	Environment II: Acoustics and Light	Lam
48-412	Environment III: Mechanical Systems	Mattern
48-415	Advanced Building Systems	Hartkopf
Elective Courses		
48-572 / 48-752	Zero Energy Housing	S Lee
48-596	LEED Buildings and Green Design	Aziz
48-722	Building Performance Modeling	Lam
48-729	Productivity, Health and the Quality of Buildings	Loftness
48-738	Ecological Footprints (first half mini)	Hartkopf

Student Awards	IDC-CH2M Hill Scholarship
B Arch 5 + 1	Master of Science in Sustainable Design
Programs	ABSIC Advanced Building Systems Industry Consortium Executive Education: Sustainable Design Academy Intelligent Workplace Solar Decathlon 2002, 2005, 2007 Remaking Cities Institute
Other Opportunities	multiple competitions and grants

Context and Network of Partnerships

CFA	School of Art; School of Design; Studio for Creative Inquiry
CMU	Heinz School of Public Policy and Management Engineering and Public Policy Steinbrenner Institute for Environmental Education and Research Green Practices Committee
Local	Chatham University: Master of Landscape Architecture University of Pittsburgh; Master of Sustainable Construction
Regional	Green Building Alliance; Sustainable Pittsburgh; Heinz Foundation Civic Design Coalition
National	AIA Committee on the Environment AIA Communities by Design AIA 2030 Challenge US Green Building Council DOE; GSA; EPA; NAS; State; Architect of the Capitol; NIH; NSF; Industries
International	Oxford; China/Tsinghua; ITESM; Dresden; ETH/EPFL; Industries (e.g. EDF); Governments World Business Council for Sustainable Development; UNEP
Future	Executive Education: Sustainable Design Academy simulation lab; performance testing lab

Strategies for **ENVIRONMENT: SUSTAINABLE DESIGN**

GOALS:	**Curricular Changes / Development / Refinements / Opportunities**
Short-term	engage early design students in design for human and environmental values
	Increase faculty strengths in ecology for early design studios
Mid-term	provide hands-on experiences in ecological practices
Long-term	strengthen immersion in ecological design for place and context

GOALS:	**Student Development and Learning**
Short-term	ecological ethic across the years
	Increase student scholarships for MSSD program, raising undergraduate awareness
Mid-term	qualitative skills for ecologically leading design
	endow Solar Decathlon program for ongoing student engagement
Long-term	quantitative skills for ecologically leading design

GOALS:	**Faculty Development and Teaching** (artistic production, practice, research, scholarship)
Short-term	support for faculty to pursue LEED accreditation, strengthen ecological learning
Mid-term	endowment for faculty research on sustainable design and curriculum development

GOALS:	**School of Architecture Development** (identity, fundraising targets, promotion, visibility)
Short-term	launch Sustainable Design Academy (executive education program)
Mid-term	complete fundraising for the Invention Works/ BAPP/ MMX
Long-term	endowment for the Center for Building Performance for funding dissertations on sustainability

NEEDS:	**Human Resources**
Short-term	endowed chairs and scholarships
Mid-term	recruit tenure track design faculty with social and ecological expertise

NEEDS:	**Physical** (space and equipment)
Short-term	create lab for environmental simulation and testing, integrated with studios
Mid-term	strengthen regional design for ecology and community
Long-term	realize Invention Works/ BAPP/ MMX

NEEDS:	**Financial Resources**
Short-term	industry and NSF simulation and testing labs +/– $5M
Long-term	endow Invention Works, Chairs +/ – $25M

OUTREACH / SERVICE OPPORTUNITIES:

Short-term	facilitation and environmental lab for continuing education of practice community
Long-term	Invention Works for intelligent product development to enhance quality of life, moving beyond a built environment that is restorative to regenerative.

5.4.5 _ Environmental Technology Courses

School of Architecture

Architecture	48-312 / 317	Site Engineering and Foundations
Architecture	48-315	Environment I: Climate and Energy
Architecture	48-410 / 48-726	Environment II: Acoustics and Light
Architecture	48-412	Environment III: Mechanical Systems
Architecture	48-415	Advanced Building Systems
Architecture	48-572 / 48-752	Zero Energy Housing
Architecture	48-596	LEED Buildings and Green Design
Architecture	48-722	Building Performance Modeling
Architecture	48-729	Productivity, Health and the Quality of Buildings

Carnegie Mellon University

Design	51-274	Design & Social Change
Art	60-202	Concept Studio: Eco-Art
Art	60-432	Advanced SIS: Site-Work
Art	60-437	Advanced SIS: Environmental Sculpture
Economics	73-358	Economics of the Environment and Natural Resources
History	79-211	Disaster! Fires, Plagues, Hurricanes and Floods in American History
History	79-243	History of the Urban American Life
History	79-345	American Environmental History: Critical Issues
History	79-358	Complex Technological Systems: Past, Present and Future
History	79-365	Climate Change, Energy Policy and Environmental Protection
History	79-386	The Global Environment: Historical Perspectives and Policy Dilemmas
History	79-387	Shaping Modernity's Landscape: An Environmental History of the Americas
History	79-398	Environmental History and Politics Since Silent Spring
EPP	19-424	Energy and the Environment
EPP	19-426	Environmental Decision Making
EPP	19-440	Combustion and Air Pollution Control
EPP	19-616	Case Studies in Sustainability
Philosophy	80-244	Environmental Management and Ethics
Philosophy	80-340	Environmental Ethics and Decision Processes
Philosophy	80-344	Environmental Ethics
Heinz	90-733	Urban Development
Heinz	90-734	Urban Policy: Shaping the City
Heinz	90-779	Design, Environment and Economic Development
Heinz	90-789	Sustainable Community Development
Heinz	90-795	Technology and Policy for Disaster and Humanitarian Response
Heinz	90-798	Environmental Policy and Regulation
MCS	09-510	Introduction to Green Chemistry
MCS	09-620	Global Atmospheric Chemistry 9
CIT	12-100	Introduction to Civil and Environmental Eng. 12
CIT	12-612	Pittsburgh Brownfields: Where the Past and Future Meet Civil and Environmental Engineering 6
CIT	12-657	Water Resources Engineering 9
CIT	12-725	Fate and Transport of Organic Contaminants in the Aquatic System 12
CIT	19-616	Case Studies in Sustainability 6
Univ. Wide	99-226	Rachel Carson: Her Work and Legacy 9
Univ. Wide	99-230	Environmental Geology 9
Univ. Wide	99-231	Environmental Challenges and Solutions: Moving Towards Sustainability
Univ. Wide	99-232	Ecological Economies
Univ. Wide	99-233	Exploring Connections: the Mind, Community and the Environment 9
Univ. Wide	99-237	Introduction to Environmental Sound 9
Univ. Wide	99-521	Environmental Justice

Chatham College

100	Current Environmental Issues	1
225/262	Environmental Ethics	3
275	Ecological Economics	3
300	Perspectives on Landscape	3
317	Environmental Solutions and Systems	3
352	Environ. Organizations and Governance	3
381	Principles of Landscape Design	3
412	Applied Design Studio II	
414	Landscape Ecology	3
425	Environmental Policy	3
445	Nature and Culture	3
455	Environmental Education	3
463	Greenhouse Plant Production/Lab	3
470	Principles of Sustainability	3
ENV 525	Environmental Policy	3
ENV 543	Nature and Culture	3
LAR 514	Landscape Ecology	3
LAR 570	Principles of Sustainability	3

Community College of Allegheny County

ENT-200	Environmental Regulations	3
116	Foundations of Energy and Environment	3
491/591	Environmental Hydrogeology	3
498/598	Environmental Ecology	3
541	Environmental Policy and Law	
570/571	Fund. of Air Pollution Prevention & Control	3

La Roche College

Integ 300-009	Developing Countries & Sustainable Development	3

Robert Morris University

ENVS4060	Survey of Environmental Technology
ENVS4470	Environmental Law, Ethics & Public Policy

Point Park University

BIOL 488	Institutional Health	3
CET 205	Introduction to Surveying	3
CET 206	Environmental Engineering Technology	3
CET 309	Soil Mechanics	4
CET 321	Pollution Controls and Environmental Issues	3
EHSP 415	Environmental Economics	3
EHSP 416	Environmental Management	3
EHSP 424	Environmental Protection Policy & Reg.	3

University of Pittsburgh

COMMR 2036	History of Am. Environmental Rhetoric	3
ECON 1360	Environmental Economics	3
GEOL 0030	Geography: Global Climate & Environment	
GEOL 0860	Environmental Geology	
GEOL 3963	Issues in Environmental Policy	3
SE3 PS 1542	Global Environmental Politics	3
1695	Environmental Politics	

5.4.6 _ Curriculum Stream 6 _ Practice Management

Emerging bodies of knowledge tend to appear ill-structured even *ad hoc*. Our practice stream is a good example of such phenomenon. This section will attempt to describe how we have, over time and in the present, addressed this issue and turned it into an advantage.

It should not be in dispute that there are new areas of knowledge and instruction, albeit more often tacit than not, in the field of architecture that are gaining greater significance in its success. These range from advances in the humanities and social sciences -- real estate economics, professional licensure, and ethical conduct -- to those in business and applied sciences -- information and digital technology and AEC management. Architecture benefits from a greater understanding and control of issues like the management of design, construction and facilities; innovative use of data harvesting and representation for just-in-time applications in the office and at the field; accurately assessing the value of the intangible and tangible features of design within the design delivery process; and the pro-active transition into a well configured milieu of professional and ethical conduct. We bundle instruction and applications subsuming these areas under the heading of *Practice*.

A historical accounting of how the SOA got to this point may be instructive. In the 1970s, the School appointed it first faculty in economics, computing and human factors. This lead to significant curricular changes, in the 80s, that required students to learn the basic concepts of behavioral science, micro economics, computer programming, alongside their introductory writing, history, and physics instruction. In the 90s, the scope of architectural education in the School was broadened even more to deal with the context of architecture, including urban design, professional practice, ethical decision making, environmental responsiveness, and facilities operation. Currently, we enjoy the legacy of this rich experience with the multi-disciplinary context of our profession, and the resolve to harness all of this in a coherent framework we call practice.

Our current approach is based on *creative bundling* of these topics through threads like: case studies, situated delivery in studio and project assignments, process and product modeling research, testbed networking, and affiliation with national organizations like NIST, AIA and service industry collaborations (health care and the like). Another strategy we are trying is to *move curricular components into the domain of architecture*: "real estate economics" and "value based design" in place of "micro economics," "human factors" in place of "statistics," and "ethical decision making in architecture" in place of "applied ethics." A third strategy is to create new areas of learning and investigation by transferring *tacit knowledge into codified form*. The examples in this category include real estate economics, GIS applications in public health, design added value analysis, and ethical adjudication in architecture.

Faculty

Our key resource is the faculty. The Practice stream includes the acquisition, codification, and dissemination of the tacit knowledge that defines architecture's complex decision making milieu. Our faculty are active in developing models and recording cases that are benchmarks of economic, professional, ethical, digital, operational, and management aspects of our practice. With the aid of the most advanced technology in the field – sensors, laser printers, augmented reality, GIS mapping, robotics, simulations, and so on – we are contributing to the critical task of converting tacit knowledge of the architect's practice into coded knowledge. The strength of our curriculum in Practice is not only in this pioneering ethos but also in moving the disciplines that are traditionally outside of our field into our curriculum. We offer a series of critical and non-traditional subjects in this series.

Ömer Akin, Ph.D., RA, Professor, Design, Practice, Technology

Omer Akın's research interests include design cognition, computer aided design generation, case-based instruction, ethical decision making, design virtual worlds, building commissioning, and automated requirement management.

Kristen Kurland, Associate Teaching Professor, Practice, Digital Media

Kristen Kurland, a joint faculty appointment in Architecture and Heinz School of Public Policy and Management as an Associate Teaching Professor, teaches technology courses AutoCAD, 3D Studio MAX, GIS, CAFM and public policy (with Heinz students) in 5th year Urban Lab. Kristen also teaches Infrastructure Planning to executive physicians in their Master of Medical Management program. She has a long track record and strong focus on distance education.

Luis Rico-Gutierrez, Associate Dean, CFA, Design

Before coming to Carnegie Mellon, Rico-Gutierrez taught Urban and Computer Aided Design at the Queretaro Campus of Monterrey Tech University in Mexico; where his students tackled the urban problems of surrounding communities. At that time, he conceived and directed the "Distance Studio", and has forged a new and important initiative under the title of "Remaking Cities."

McDonald, Dutch, AIA

Minnerly, Mark F., RA

Christine Mondor, RA, Adjunct Assistant Professor, Design, History/Theory
Christine teaches architecture and landscape design at Carnegie Mellon University and Chatham College. She has been a board member of Green Building Alliance, Three Rivers Association for Sustainable Energy (TRASE), and the Southwestern Pennsylvania Regional Planning Commission among others. Christine is a LEED Accredited Professional.

Framework within the School

Mission
Teach the ecology of design and the connections between the built environment and natural, social (including cultural and intellectual), and economic systems.

Required Courses

48-351	Human Factors in Architecture	Mondor
48-452 / 48-725	Real Estate Design & Development	Minnerly, M.
48-550	Issues of Practice	MacDonald
48-453	Urban Design	Rico-Gutierrez
48-551	Ethics and Decision Making in Architecture	Akin

Elective Courses

48-568	Advanced AUTOCAD & 3D Visualization	Kurland
48-569 / 48-781	GIS / CAFM	Kurland

Curricular Threads
B Arch 5 + 1, Master of Science, and PhD in AECM, joint with the Department of Civil and Environmental Engineering

Context and Network of Partnerships

CFA	School of Design [Service Design]
CMU	Civil and Environmental Engineering [joint AECM degree; research projects] Tepper School [curricular offerings]
Local	Internship program: Southland Industries, Kossman Development Corp., A. J. Martini, KPMG consulting, Turner, Dick Group and American Bridge, Vanadium Group
Regional	Internship program: Turner Construction, Michael Baker Associates, Gensler
National	IFMA (facility managers), APPA (universities), AFE (public works), BOMA (real estate and building management)
Future	Center for Advancement of Service and Corporate Architecture and Design

Student Awards
George W Anderson, Jr. Award for “Attention to detail and community service” available to graduate students only

Strategies for **Practice Management**

GOALS:	**Curricular Changes / Development / Refinements / Opportunities**
Short-term	introduce required leadership training workshop for 4th/ and 5th year students
Mid-term	evolve Human Factors to a focused, advanced course – basic incorporated into early studios
Long-term	add advanced electives, add to intellectual advancement
GOALS:	**Student Development and Learning**
Short-term	develop tools for decision-making (emphasize process through studio sequence)
Mid-term	emphasize communication skills (verbal and visual presentation, writing)
Long-term	increase communication with lay people and community (diverse audiences)
GOALS:	**Faculty Development and Teaching** (artistic production, practice, research, scholarship)
Short-term	engage outside professionals/practitioners to expose students to process of practice/management
Long-term	add lecturers and visiting faculty (1-2 semesters or even 1-2 week sketch problems)
GOALS:	**School of Architecture Development** (identity, fundraising targets, promotion, visibility)
Short-term	support School's Initiative for Architecture Mentorship [I AM]
	maintain leadership in AIA national case studies program
Mid-term	develop internship / coop program
NEEDS:	**Human Resources**
Short-term	add full-time faculty line in this area
Mid-term	commission outside committee to review our adjunct faculty integration
NEEDS:	**Financial Resources**
Short-term	endow faculty lines and lecturers
Mid-term	facilitate interaction with the community
Long-term	endow case studies program as full continuing education opportunity

5.4.6 _ Practice, Ethics, and Management Courses

School of Architecture

Architecture	48-351	Human Factors in Architecture	9
Architecture	48-452 / 48-725	Real Estate Design & Development	9
Architecture	48-550	Issues of Practice	9
Architecture	48-453	Urban Design	9
Architecture	48-551	Ethics and Decision Making in Architecture	9
Architecture	48-568	Advanced AUTOCAD & 3D Visualization	12
Architecture	48-569 / 48-781	GIS / CAFM	

Carnegie Mellon University

Tepper	70-332	Business, Society and Ethics	9
Tepper	70-341	Organizational Communication	9
Tepper	70-342	Managing Across Cultures	9
Tepper	70-345	Oral Communication	9
Tepper	70-381	Marketing	9
Tepper	70-397	Venture Capital Investing	9
Tepper	70-415	Introduction to Entrepreneurship	9
Economics	73-100	Principles of Economics	9
Economics	73-357	Regulation: Theory and Policy	
Economics	73-358	Economics of the Environment and Natural Resources	9
Economics	73-365	Industrial organization	9
Philosophy	80-230	Ethical Theory	9
Philosophy	80-241	Ethical Judgments in Professional Life	9
Philosophy	80-242	Conflict, Culture and Dispute Resolution	9
Philosophy	80-243	Business Ethics	
Philosophy	80-244	Environmental Management and Ethics	9
Heinz	90-733	Urban Development	6
Heinz	90-749	Arts in Society	
Heinz	90-752	Law and the Arts	
Heinz	90-779	Design, Environment and Economic Development	
Heinz	90-789	Sustainable Community Development	12
Heinz	90-798	Environmental Policy and Regulation	

Carlow University

CC 101	Presentations and Argumentation	3
CM 220	Interpersonal Communication	3
CM 357	Communication Ethics	3
PH 208	Ethics, Politics and Public Policy	3
PH 349	Argumentative Writing	3

Chatham College

117	Human Values and Ethics	3
203	Citizenship and Civic Engagement: Building the Good Society	3
212	Business and Professional Ethics	3
225	Environmental Ethics	3
276	Art, Beauty, Truth	3
382	Rights, Justice, and the Law	3
445	Professional Practice	3
LAR 660	Theory, Ethics and Professional Practice	

Duquesne University

102	Public Speaking	3
103	Introduction to Interpersonal Communication	3
114	Introduction to Intercultural Communication	3
201	Human Communication and Society	3
202	Business and Professional Communication	3
203	World Communication and Professional Civility	3
418	World Conflict Management in Organizations	3
427	Communication Management	3
440	Communication Ethics and Technology	3

Pittsburgh Theological Seminary

ET33	Ethics and Technology

Point Park University

ACC 304	Presentations	3
ACC 401	Law and Ethics of Corporate Communication	3
BMGT 301	Ethics in Business	3
BMGT 316	Labor and Management Relations	3
BUS 306	Professional Communication Practices	3
BUS 404	Philosophical Concepts for Business Ethics	3
CET 309	Soil Mechanics	3
PHIL 201	Ethics	3
PHIL 240	Ethics in the Professions Every Term	3
PROF	160 Professional Ethics	3

Robert Morris University

ENVS4470	Environ Law, Ethics, and Public Policy	3
FINA4100	Real Estate Investment Analysis	3
MGMT3600	Human Resource Management	3
MGMT3700	Labor Management Relations	3
SACE2300	Organizational Ethics	3
SPMG3420	Facility Management	3

University of Pittsburgh

BUSE 1010	Business Economics	3
CEE 1200	Construction Management	3
CEE 2201	Construction Cost Estimating	3
CEE 2204	Construction Law and Risk Mgmt.	3
CEE 2285	Construction Management Seminar	1
ENGC 1100	Language of Business and Industry	3
LEGLST 1152	Legal Issues in Public Service	3
PHIL 0300	Introduction to Ethics	3
PUBSR 0030	Public Policy Process	3
PUBSR 0050	Ethics and Accountability	3
1213	Law and Politics	
1241	Public Administration & Political Systems	
0030	Financial Accounting	
0060	Ethics & the Business Environment	
1040	Introduction to Marketing	
1080	Strategic Management	

5.5 _ Study Abroad








5.5 _ Study Abroad and Travel

Architecture Exchange Programs

BELGIUM, Antwerp
Henry Van de Velde Institute
College of Design Sciences

MEXICO, Monterrey
Instituto Tecnológico de
Estudios Superiores de Monterrey

SINGAPORE
National University of Singapore

SWITZERLAND, Lausanne
Ecole Polytechnique Fédérale
de Lausanne (EPFL)

UNITED KINGDOM, Oxford
Oxford School of Geography

University Exchange Programs

AUSTRALIA, Melbourne
University of Melbourne

CHILE, Santiago
Pontificia Universidad Católica

HONG KONG
City University

JAPAN, Tokyo
Keio University

ISRAEL
Technion - Israel Institute of
Technology

External Programs (for Architecture)

ARGENTINA, Buenos Aires
University of Buenos Aires

AUSTRALIA, Adelaide
University of Adelaide

AUSTRALIA, New South Wales
University of New South Wales

AUSTRALIA, Sydney
University of Sydney

AUSTRIA, Vienna
Technical University of Vienna

BELGIUM, Antwerp
Henry Van de Velde Institute

CZECH REPUBLIC, Prague
North Carolina State University

CHINA
Syracuse University

DENMARK, Copenhagen
Denmark's International Study
Program (D.I.S.)

FRANCE, Avignon
Institute for American Universities

IRELAND, Belfast
Queen's University of Belfast

ITALY, Bologna
Universita de Bologna

ITALY, Florence
University of Notre Dame

ITALY, Florence
Syracuse University

ITALY, Milan
Nuova Accademia di Belle Arti

ITALY, Rome
American Institute of Roman Culture

ITALY, Rome
Cornell University

ITALY, Rome
Penn State University-Sede di Roma

ITALY, Rome
Temple University

ITALY, Rome
University of Notre Dame

ITALY, Rome
Roma Tre

ITALY, Venice
Universita Luav di Venezia

JAPAN, Tokyo
Temple University

KOREA
Yonsei University

LATVIA
Riga Technical University

NEW ZEALAND, Auckland
University of Auckland

NEW ZEALAND, Victoria
University of Victoria

POLAND, Krakow
Technical University of Krakow

SPAIN, Barcelona
Elisava School of Design

SPAIN, Barcelona
Universitat Internacional de
Catalunya

SPAIN, Pamplona
Universidad de Navara

UNITED KINGDOM, London
Architectural Association

UNITED KINGDOM, London
Bartlett School, University College

University Sponsored Programs (General)

AUSTRALIA, Gold Coast
Bond University

AUSTRALIA, Melbourne
University of Melbourne

AUSTRALIA, Sydney
University of New South Wales

AUSTRIA, Vienna
IES Abroad

BOTSWANA
School for International Training

CANADA, Montreal or Ottawa
Laval University

CHILE, Valparaiso
SIT

CHINA, Beijing
IES Abroad

DENMARK, Copenhagen
Denmark International Studies

DOMINICAN REPUBLIC, Santiago
CIEE

ECUADOR, Quito
IES Abroad

FRANCE, Aix-en-Provence
Institute for American Universities

FRANCE, Avignon
Institute for American Universities

GERMANY, Berlin
IES Abroad

GERMANY, Berlin
LEXIA

GHANA
School for International Training

IRELAND, Ballyvaughan
Burren College of Art

IRELAND, Dublin
Trinity College

ITALY, Rome
Temple Rome

ITALY, Milan
IES Abroad

JAPAN, Nagoya
IES Abroad

JAPAN, Tokyo
IES Abroad

NEW ZEALAND, Auckland
Auckland Institute of Technology

NEW ZEALAND, Auckland
IES Abroad

RUSSIA
Middlebury College

SPAIN, Barcelona
IES Abroad

SPAIN, Granada
IES Abroad

SPAIN, Madrid
IES Abroad

SPAIN, Salamanca
IES Abroad

SOUTH AFRICA
Interstudy

SOUTH AFRICA
School for International Training

NETHERLANDS, Amsterdam
IES Abroad

UNITED KINGDOM, London
London School of Economics

UNITED KINGDOM, London
University College of London

UNITED KINGDOM, Manchester
University of Manchester

Semester Study Abroad Programs

Year	Location	# Students
2007	Barcelona, Spain	2
2007	Florence, Italy	2
2007	Berlin, Germany	2
2007	Lausanne, Switzerland	1
2007	Copenhagen, Denmark	2
2007	London, UK	1
2007	Cape Town, South Africa	1
2007	Haifa, Israel	1
2007	**TOTAL**	**12**
2006	London, UK	2
2006	Singapore	1
2006	Buenos Aires, Argentina	2
2006	Rome, Italy	1
2006	Copenhagen, Denmark	2
2006	Prague, Czech Republic	2
2006	Melbourne, Australia	1
2006	**TOTAL**	**11**
2005	Barcelona, Spain	2
2005	Melbourne, Australia	2
2005	London, UK	1
2005	**TOTAL**	**5**
2004	Barcelona, Spain	4
2004	Copenhagen, Denmark	1
2004	Auckland, New Zealand	3
2004	Wellington, New Zealand	2
2004	Oxford, UK	1
2004	**TOTAL**	**11**
2003	Oxford, UK	1
2003	Melbourne, Australia	3
2003	Copenhagen, Denmark	7
2003	Florence, Italy	1
2003	Barcelona, Spain	1
2003	Belfast, Northern Ireland	1
2003	Singagore	1
2003	**TOTAL**	**15**
2002	Barcelona, Spain	2
2002	Copenhagen, Denmark	2
2002	Rome, Italy	1
2002	Paris, France	1
2002	Zurich, Switzerland	1
2002	Melbourne, Australia	2
2002	Singapore	1
2002	**TOTAL**	**10**
2001	Copenhagen, Denmark	3
2001	India/SouthAfrica/Brazil	1
2001	Paris, France	1
2001	Mons, Belgium	1
2001	Krakow, Poland	2
2001	Valencia, Spain	1
2001	Lausanne, Switzerland	6
2001	Manchester, UK	1
2001	**TOTAL**	**16**
2000	Lausanne, Switzerland	5
2000	Manchester, UK	1
2000	**TOTAL**	**6**

Summer Study Abroad Programs

Year	Location	# Students
2007	Copenhagen, Denmark	3
2007	Mexico	1
2007	**TOTAL**	**4**
2006	Rome, Italy	2
2006	Berlin, Germany	1
2006	**TOTAL**	**3**
2005	London, UK	1
2005	Berlin, Germany	1
2005	**TOTAL**	**2**
2004	Shimla & Mussoorie, India	1
2004	Prague, Czech Republic	2
2004	Havana/San José	1
2004	Madrid, Spain	1
2004	Rome, Italy	2
2004	**TOTAL**	**7**
2003	Madrid, Spain	1
2003	Berlin, Germany	1
2003	**TOTAL**	**2**

School of Architecture Summer Abroad Studios

Year	Location	Faculty	# Students
2008	Venice, Italy	Jennifer Lucchino	18
2007	Hong Kong	Khee Poh Lam	5
2006	China and Singapore	Khee Poh Lam	11
2005	Rome and Barcelona	Kai Gutschow Laura Lee Diane Shaw Luis Rico-Gutierrez	22
2004	Japan	Stephannie Bartos	17
2003	Prague, Czech Republic	Omer Akin Henry Hanson	12
2001	Rome, Italy	Laura Lee Steve Lee	18

College of Fine Arts Multidisciplinary Study Abroad Programs

Year	Location	Faculty	# Students
2002	Rome, Italy	Laura Lee	16
2001	Rome, Italy	Laura Lee	47
2000	Barcelona, Spain	Laura Lee	8

School of Architecture Foreign Study Trips

Year	Location	Faculty	# Students
2007	Qatar	Rami el Samahy Kelly Hutzell	7
2007	India	Gerard Damiani Kai Gutschow	14
2006	Manchester, UK	Kelly Hutzell	10
2006	Darmstadt, Germany	Steve Lee	8
2005	Queretaro, Mexico	Luis Rico-Gutierrez	12
2005	Florence, Italy	David Burns	8

5.5 _ Domestic Travel

2004/05

First year studio	[68 students]	New York	for 3 days in February
Second year studio	[52 students]	New York	for 3 days in November
Third year studio	[48 students]	Washington DC	for 3 days in October
Fourth year students	[10 students]	Boston	for 3 days in February
Fourth year students	[6 students]	Washington DC	for 5 days November

2005/06

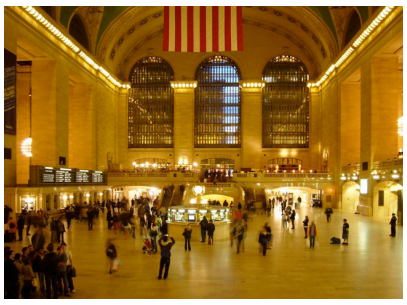
Second year Damiani studio	[12 students]	Chicago	for 3 days in March
Second year Wolff studio	[12 students]	Cleveland	for 3 days in March
Second year students	[62 students]	Chicago	for 3 days in October
Third year studio	[36 students]	Washington, DC	for 3 days in October
Fourth year Fineout studio	[10 students]	Cleveland	for 3 days in March
Fourth year Carlough studio	[12 students]	Detroit	for 3 days in March
Fourth year Carlough studio	[12 students]	Atlantic City	for 3 days in October

2006/07

Solar Decathlon team	[12 students]	Germany	for 2 weeks in May
Fourth year Fineout studio	[12 students]	Buffalo	for 3 days in May
Second year studios	[54 students]	Chicago	for 3 days in September
Third year studios	[58 students]	Washington, DC	for 3 days in September
Fourth year Bartos studio	[10 students]	Boston	for 3 days in October
Fourth year Carlough studio	[14 students]	New Orleans	for 3 days in February
Fourth year Bartos studio	[11 students]	New York	for 3 days in February
First year studios	[68 students]	New York	for 4 days in March








5.6 _ Internship Placement

Sponsored by the College of Fine Arts and the Carnegie Mellon Career Center, Making a Living, Living Your Dream is an annual career fair and networking event specifically geared for students in artistic fields and interdisciplinary interests. MLLD brings national organizations to Carnegie Mellon to recruit for summer internships and permanent positions and provides students with the opportunity to explore possible professional experiences in alternative artistic/design areas.

Firm Name	Contact Name	City	State
2000			
Martin A. DeSapio	Bradford Worthington, Project Arch.	Flemington	NJ
Van Dijk Pace Westlake Architects	Rhonda Hansel, Associate	Cleveland	OH
Kitchen and Associates	Stephen Schoch, AIA	Collingswood	NJ
Plumb Design, Inc.	Marc Tinkler, Principal	New York	NY
LemayErikson Architects	Christine West, AIA	Reston	VA
2001			
Home IQ, Inc.	Glenn Cottrell	Pittsburgh	PA
Van Dijk Pace Westlake Architects	Rhonda Hansel, Associate	Cleveland	OH
CAP Gemini Ernst & Young	James Kuo	New York	NY
RSH Architects	Arthur R. Ruprecht, AIA	Pittsburgh	PA
LemayErikson Architects	Christine West, AIA	Reston	VA
2002			
David M. Schwarz Architectural Services, Inc.	Jon Zubiller	Washington	DC
HOK Washington, DC	Jim Kessler, Senior Principal	Washington	DC
LukmireGrant	Jon M. Grant	Lanham	MD
Oudens + Knoop Architects, PC	Stuart Knoop	Chevy Chase	MD
Svigals + Partners, LLP	Barry Svigals	New Haven	CT
The SLAM Collaborative	Joan L. Saba, Principal	Glastonbury	CT
2003			
Michael Baker Corporation	Michael Anderson	Moon Township	PA
HOK Sport + Venue + Event	Dennis Reynolds, Principal	Kansas City	MO
Hotopp Associate Limited	Malchus Janocko, Designer	New York	NY
	Jerrod Smith, Production Designer	New York	NY
Jack Rouse Associates	Randy Vuksta, Design Director	Cincinnati	OH
Part Place Studios	Park Wame, President	Pittsburgh	PA
Prellwitz/Chillinski Associates Inc.	Derek Rubinoff, Architect	Boston	MA
RTKL	Gordon Godat, Associate Vice-P	Baltimore	MD
Sheply Bullfinch Richardson and Abbott	Jessica Smith, Human Resources	Boston	MA
Wyrd Productions	Rick Miller, Artistic Direction	Toronto	
2004			
Burt Hill Kosar Rittelmnn Assoc.	Anton H. Germishuizen	Pittsburgh	PA
Daedalus Design	Matthew W. Goodworth	Yarmouth	ME
Van Dijk Westlake Reed Leskosky	Rhonda Peterson Hansal	Cleveland	OH
Deutsch Advertising	Edward S. Pak	New York	NY
Gensler	Suzette I. Stoler	Washington	DC
KAH Architects	Kathy Hrabovsky		
	Michael Oppenheimer		
UPMC	David Lionetti	Pittsburgh	PA
HOK Sport + Venue + Event	Kobi Bradley	Kansas City	MO
2005			
Grant Architects PC	Jon M. Grant, President	Baltimore	MD

Bohlin-Cywinski-Jackson	Natalie Gentile, Senior Associate	Pittsburgh	PA
	Sarah Drake	Pittsburgh	PA
Burt Hill Kosar Rittelmann	Jon Shimm, Principal	Pittsburgh	PA
	Chris Reynolds, Graduate Architect	Pittsburgh	PA
Caldwell Architects	Lori Hashimoto, Graduate Architect	Marina Del Rey	CA
HOK	Bryant Bosland	New York	NY
Perkins Eastman	Arch Pelley	Pittsburgh	PA
	Mark O'Matz	Pittsburgh	PA
Renaissance 3 Architects	Rebecca Leet, Project Architect	Pittsburgh	PA
RTKL Associates	Robert Berry	Baltimore	MD
	Megan Nash	Baltimore	MD
Urban Design Associates	Rob Robinson	Pittsburgh	PA
2006			
ADD INC.	Scott Smith	Cambridge	MA
Bergmeyer Associates, Inc.	Sue Metzinger	Boston	MA
Burt Hill	Belinda Hanratty	Butler	PA
Francis Cauffman Foley Hoffmann, Architects Ltd.	Erin Nunes	Philadelphia	PA
Gensler	Lina Fallin	Washington	DC DC
Grant Architects PC	Jon M. Grant	Baltimore	MD
IBACOS/BuildIQ	Jill Porter	Pittsburgh	PA
IDC Architects	Michael Warren	Moon Township	PA
Mangan Group Architects	John Mangan	Tacoma Park	MD
Looney Ricks Kiss, Architects	Steve Auterman	Memphis	TN
Perkins Eastman Architects	Arch Pelley	Pittsburgh	PA
Perkins + Will	Sindu Meier	Boston	MA
RTKL Associates Inc.	Megan Nash	Baltimore	MD
SmithGroup	Edith Hahn	Washington	DC
Urban Design Associates	Lori Sipes	Pittsburgh	PA
2007			
Arquitectonica	Steven Song	New York	NY
Astorino	Nikki Stewart	Pittsburgh	PA
Bergmeyer Associates, Inc.	Rachel Zsembery	Boston	MA
Buro Happold Consulting Engineers, P.C.	Matthew Herman	New York	NY
Burt Hill	Belinda Hanratty	Pittsburgh	PA
Clean Water Action	Rachael Wall	Pittsburgh	PA
Chicago Scenic Studios	Robert Doepel	Chicago	IL
David M. Schwarz, Architectural Services	Sean Nohelty	Washington	DC
Design + Construction Strategies	Billy Mays	Washington	DC
Devlin Architecture	Michael Dwyer	Pittsburgh	PA
Elkus Manfredi Architects	Can Tiryaki	Boston	MA
Francis Cauffman Foley Hoffmann Architects Ltd.	Thomas Gavin	Philadelphia	PA
Gensler NY	Lauren McFarland	New York	NY
HNTB Architecture Inc.	Sangñeun Sonny Jang	New York	NY
IBACOS, Inc.	Jill Porter	Pittsburgh	PA
IDC Architects	Jason Chen	Moon Township	OA
IOMEDIA	Shannon McGee	New York	NY
Looney Ricks Kiss, Architects	Amy Smith	Memphis	TN
Mangan Group	John Mangan	Tacompa Park	MD
NBBJ	Craig Watterson	Columbus	OH
Orbital Engineering, Inc.	Michael Belmear	Pittsburgh	PA
Perkins + Will	Sindu Meier	Boston	MA
Perkins Eastman	Arch Pelley	Pittsburgh	PA
Peter Margittai, Architect	Stephanie Armbruster	Pittsburgh	PA
Regional Internship Center	Erin Baker	Pittsburgh	PA
Urban Design Associates	Lori Sipes	Pittsburgh	PA

6.0 Graduate Programs

6.1 _ Master Degree Programs

The School of Architecture offers six Master degree programs:

Master of Urban Design (2 semester + summer)
Master of Science in Architecture (2 semester)
Master of Science in Building Performance and Diagnostics (4 semester)
Master of Science in Computational Design (4 semester)
Master of Science in Sustainable Design (2 semester + summer)
Master of Science in Architecture, Engineering, and Construction Management (jointly with Department of Civil Engineering) (2 semester + summer)

MS-SD	M-UD	MS-AECM	MS-A	MS_BPD	MS-CD
6.5	3.75	3.25	0.75	0.5	0.5

Table 1: Average number of new students, by program, 2004-2007, from high to low

Problems:
- Low enrollments MS-A, MS-BPD, and MS-CD
- M UD program students lack studio experience, cannot keep up with 5th year B.Arch students
- Confusing array of six Master degrees

Opportunities:
- Play to CMU's disciplinary strengths in engineering, computer science
- Support programs that are currently attracting students (MS-AECM, MS-SD, M.UD)
- Consolidate to reduce overall number of Master programs
- Coursework for MS-SD and MS-BPD is nearly identical

Strategies:
- Overlap Master program courses with upper division undergraduate courses
- Overlap course requirements among Master degree programs

Actions: **Option 1**
- Cease advertising and enrolling MS-Architecture students.
- Hire tenure-line faculty member in urban design to champion Urban Design program
  short-term: require studio background for M.UD students so 5th yr Urban Lab can serve them
  long-term: resolve whether studio-based or multi-disciplinary integrative
- Retain MS-BPD program as default degree for BPD PhD students who complete coursework but do not continue to PhD
  Cease advertising, enrollment in MS-BPD - and use MS-SD as "feeder" program for PhD-BPD
- Retain MS-CD program as default degree for CD PhD students who complete coursework but do not continue to PhD
  Cease advertising and enrollment in MS-CD. Reinvent MS-CD or use new M-CD program as attractor for PhD-CD
- Launch new 1 year studio-based M-CD program

The Master of Computational Design (MCD) program is a one-year program that centers around new computational technologies in making. Neither a research nor professional degree, the MCD program would attract two distinct groups of applicants: those with significant engineering and/or computer science knowledge who wish to apply it in more creative endeavors, and those with design, art, or architecture experience who wish to master technological means of making. The scope of study is broad, from digital fabrication to analog and digital electronics, to media and materials, to programming. The program would aim for a cohort of approximately ten MCD students who would take courses in these areas, a design studio where they apply skills they and discuss the literature of this emerging field.

Outcome:
The School advertises and enrolls new students in four Master programs:
Master of Science - Sustainable Design
Master of Science - Architecture Engineering Construction Management (with Civil Engineering)
Master of Computational Design (re-invented as 1 year or 1 year + summer studio based program
Master of Urban Design, requiring design background from students

Actions: **Option 2**
- Consolidate curricula of 6 Master degree programs
- Develop core set of trans-disciplinary courses common to all degrees, attracting graduate students from other disciplines

Master of Science (M.S.) in Architecture (9 month)

The Master of Science in Architecture degree program is intended primarily for practitioners in the building industry who are interested in gaining state-of-the-art knowledge and skills in computation and building performance. Applicants to the program are expected to have a prior degree related to the building sector, including architecture, engineering, planning, or management. The program is designed to be completed in nine months allowing those who are already established in the industry to take a leave and return with relatively little discontinuity in their professional careers.

		Fall		Spring	
	Units	Number	Course	Number	Course
General	21	48.711	Research Models and Methods in Architecture (9)		
		48.722	Building Performance Modeling (12)		
Core (SKILLS course)	9	48.725	Real Estate Design and Development (Graduate) (12) OR		
		48.726	Acoustics and Lighting (9) OR		
		48.767	Software Requirement Modeling (6) AND		
		48.768	Software Requirement Application (6)		
Core Selectives	18				From courses accepted as fulfilling a core requirement in Computational Design, Building Performance and Diagnostics, Sustainable Design, or AEC Management*
Computing / Alternatives	18		Recommended computing course - one of the following**		
		15.100	Introductory/Intermediate Programming (10) OR		
		15.111	Intermediate/Advanced Programming (10)		
Electives	18		Electives (Fall or Spring)		

* Some core courses are offered in the Fall semester and students wishing to elect those courses as one of their selective requirements will need to modify their schedule, for example, by taking their computing or alternative in the Spring semester.
**Students may petition to substitute the computing course by an elective, subject to approval by the Graduate Program Committee.

In addition to the standard requirements for all graduate students in the School of Architecture, students in this program must satisfy:

- Students must complete a minimum of 75 units of course work for graduation.
- The minimum full-time residency requirement is two academic semesters. Full-time status requires a minimum of 36 units per semester during the residency period.
- Students must start the sequence of courses in the Fall semester.

Transferring to other Master programs

Students in the MSA program who wish to apply for a transfer to any of the other Master programs in the School of Architecture should ensure that their selectives are taken from the core courses for the intended concentration area. Refer to the specific program description and curriculum for details.

Master of Science (M.S.) in Architecture-Engineering-Construction Management (9 month or 16 month)

The Master of Science degree program in Architecture-Engineering-Construction Management is offered jointly with the Department of Civil and Environmental Engineering.

The program aims to prepare building delivery professionals - civil engineers construction planners, facility managers, developers, architects, planners, landscape architects, interior designers, and other building consultants - for careers in decision making that can have a positive impact on economic, environmental, and ethical concerns through the management of design, construction, maintenance, and use of facilities.

The program is intended for professionals who are prepared to take a year off from their employment or for recent graduates who are looking to diversify their qualifications prior to entering the job market. The program is structured to fit either a 9-month (two semesters) or a 16-month (three semesters + summer) time frame for those with or without prior professional experience respectively.

Curriculum 9 month

		Fall		Spring	
	units	Number	Course	Number	Course
Quantitative Methods	24	12.704	Probability and Estimation Methods for Engineering Systems (12)	48.759	Value Based Design in AEC (12)
Micro-Economics	24	12.706	Civil Systems Investment Planning and Pricing (12)		
		48.725	Real Estate Design and Development (Graduate) or equivalent (12)		
Management	24	12.711	Advanced Project Management for Construction (12)	48.781	Knowledge Management in Architecture and Planning (12)
Project / Elective	24			48.766	AEC Synthesis (12)* or Elective Elective (var.)

Curriculum 16 month

		Fall		Spring	
	units	Number	Course	Number	Course
Quantitative Methods	24	12.704	Probability and Estimation Methods for Engineering Systems (12)	48.759	Value Based Design in AEC (12)
Micro-Economics	24	12.706	Civil Systems Investment Planning and Pricing (12)		
		48.725	Real Estate Design and Development (Graduate) or equivalent (12)		
Management	24	12.711	Advanced Project Management for Construction (12)	48.781	Knowledge Management in Architecture and Planning (12)
Elective	24				Elective (combined 24 units required between Spring and following Fall)
		Summer		**Fall**	
Internship			Internship		
Project / Elective			(see note above)	48.766	AEC Synthesis (var. 12-24)* OR Elective

* The project course deals with synthesis in solving AEC problems using the tools, theories, and methods studied in the program courses. Sponsors from government agencies, NGOs, or the private sector will be invited to underwrite real or realistic facility or design management problems. Students and faculty work in teams to formulate and resolve problem defined by these entities, which will serve as 'clients.' At the end of the semester, student groups will present their work to t he clients and develop as self-evaluation of their work. The Fall and Spring semester courses taken successively provide a sequence.

Degree Requirement:

In addition to the standard requirements for all graduate students in the School of Architecture, students in this program must satisfy:

- Students must complete a minimum of 96 units of course work for graduation.
- The residency requirement (9- or 16-month) is determined at admission based on the previous
- experience and preparation of the candidate. The minimum full-time residency requirement for either time frame is two academic semesters. Full-time status requires a minimum of 36 units per semester during the residency period. .
- Students must start the sequence of courses in the Fall or Spring semester.

Master of Science (M.S.) in Building Performance and Diagnostics (2 year)

The Master of Science degree program in Building Performance and Diagnostics is intended for practitioners, researchers, and educators in architecture and the building industry who wish to be leaders in advanced building technologies and their performance. The program covers, in depth, knowledge about the state-of-the-art in building systems integration and total building performance. The program culminates with a project in which students must apply the knowledge they have acquired to realistic problems, using the appropriate analytic and modeling skills. The program is open to graduates with a prior bachelor's degree and who have some connection with the building sector through architecture, engineering, planning, or management. Graduates of this program from Carnegie Mellon University have found outstanding careers in practice, industry, and education.

Year 1		**Fall**		**Spring**	
	Units	Number	Course	Number	Course
General	9	48.711	Research Models and Methods in Architecture (9)		
Core	21	48.722	Building Performance Modeling (12)	48.723	Performance of Advanced Building Systems (9)
Core Selectives	18		Selectives* (Fall or Spring)		
Computing / Alternatives	18		Recommended computing course** (Fall or Spring)		
		15.100	Introductory/Intermediate Programming (10) OR		
		15.200	Advanced Programming (9)		
Open Selections	9		Open Selections*** (Fall or Spring)		

*Selectives are courses that are accepted as fulfilling the requirement of showing proficiency in aspects of Building Performance and Diagnostics.
**Computing is not required for MS (BPD) students - recommended for those intending to do a PhD in performance simulation. Students may substitute with a selective or elective, subject to approval by the Graduate Program Committee.
***Open selections enable students to take necessary prerequisites without extending the duration of their program. Students otherwise take elective(s) subject to approved by the Graduate Program Committee.

Year 2		**Fall**		**Spring**	
	Units	Number	Course	Number	Course
Core	24	90.711	Empirical Methods for Public Policy and Management (12)+	90.722	Management Science I: Optimization and Multi-criteria Methods (6)+
		90.772	Operations Research for the Public Sector (6)+	90.760	Management Science II: Decision Risk Modeling (6)+
				48.721	Building Controls and Diagnostics (12)
Electives	15		Electives* (Fall or Spring)		
Project	36	48.702	Master's Project (18)++	48.703	Master's Project (var. 18-36)++

+ Select 90-711 or any combination of 90-772, 90-722 and 90-760 for a total of 12 units.
++ Master's projects provide students with the opportunity to conduct research under the direction of the School's faculty. Normally, the project is undertaken in the Spring semester. However, with the approval of their faculty advisor, students may elect to spread the project over two semesters (18 units per semester) and take an appropriate number of required or elective courses to maintain fulltime status.

Core Selectives
These are among the concentration courses accepted by the program as fulfilling the requirement of students showing proficiency in core aspects of Building Performance and Diagnostics. The following courses are presently accepted as fulfilling this requirement:
12-651 Air Quality Engineering (9)
12-726 Mathematical Modeling of Environmental Quality Systems (12)
48-752 Zero Energy House (9)
48-725 Real Estate Design and Development (Graduate)(12)
48-726 Acoustics and Lighting (9)
48-729 Special Topics in BPD (variable units)
48-737 Productivity, Health and Quality of Buildings (9)
48-795 LEED™ Buildings and Green design Concepts (9)

Student may also elect to take other courses as concentration selectives, not listed above but offered elsewhere in the university and related to the interest area of Building Performance and Diagnostics (for example, courses in energy and environmental policy/systems, green design, etc.), subject to approval by the Graduate Program Committee.
Owing to periodic changes to the curricular offerings, students may, under the advice and of their faculty program coordinator, and approval of the Graduate Program Committee, elect alternative courses to fit within this category.

Open Selections
Open selections enable students to take necessary prerequisite courses, which may be required for certain concentration selectives, without extending the duration of their program.
The following physics course is recommended for students wishing to pursue an interest in the area of energy and environmental policy:
24-721 Thermodynamics

Students who wish to pursue a PhD in the Building Performance and Diagnostics in performance simulation are encouraged to take 15-211 Fundamental Data Structures and Algorithms for which the following course is a mathematical prerequisite:
21-127 Concepts of Mathematics

There may be other more suitable prerequisites that meet the student's specific interest. Those courses can be elected, after consultation with the Faculty Program Coordinator.

Student must submit all petitions for course substitution or election in writing through the Faculty Program Coordinator to the Graduate Program Committee for approval.

Degree Requirement
In addition to the standard requirements for all graduate students in the School of Architecture, students in this program must satisfy:

- Students must complete a minimum of 150 units of course work for graduation. . The minimum residency requirement is 3 academic semesters. Full-time status (minimum 36 units per semester) is required during the residency period.
- Students must start the sequence of courses in the Fall semester.

Information for MSA Students
Students who have completed the Fall and Spring semester requirements of the MSA degree can apply for a transfer to the 2-year MS (BPD) Program. With the approval of the Graduate Program Committee, the student may enroll in the second year of the Program, subject to conformance to the Program requirements.

Master of Science (M.S.) in Computational Design (2 year)

The Master of Science degree program in Computational Design is intended primarily for practitioners in the building industry who wish to broaden their knowledge about the state-of-the-art in computer approaches and applications to architectural and building sciences, and for individuals who wish to pursue research careers in these areas. The program covers, in depth, a range of computational design issues and culminates with a project where students apply acquired knowledge to realistic problems. The program is open to graduates with a prior bachelor's degree and who have some connection or interest in design through architecture, engineering, computer science, planning, management, or computer-aided design.

Year 1		**Fall**		**Spring**	
	Units	Number	Course	Number	Course
General	9	48.711	Research Models and Methods in Architecture (9)		
Computing	24	48.756	Application in CAD (12)	48.770	Computation I; Introduction to Programming and Databases (12)
Project	24		MS(CD) Project Course I & II (Fall & Spring)		
Elective	12		Electives (Fall & Spring)*		

Selectives are courses that are accepted as fulfilling the requirement of showing proficiency in core aspects of Computational Design. Most selectives expect some programming skill as a prerequisite. Students without prerequisites should use the elective slot to take such courses without extending the duration of the program, e.g., 21-127 Concepts of Mathematics, is a prerequisite for 15-211, required for all MS (Computational Design) students.

Year 2		**Fall**		**Spring**	
	Units	Number	Course	Number	Course
Concentration Selectives	9		Concentration Selectives (Fall & Spring)		
Computing	24	15.211	Fundamentals of Data Structure and Algorithms (12)	15.212	Principles of Programming (12)
Project	24		MS(CD) Project Course III & IV (Fall & Spring)		
Elective	12		Electives (Fall & Spring)		

+ Completion of one or more of 15-212, 15-213 or 17-652 is required for candidacy in the PhD program in Computational Design.

Concentration Selectives
These concentration courses, subject to approval by the Graduate Program Committee, are accepted by the program as fulfilling the requirement of students showing proficiency in some aspects of Computational Design. These courses may be offered by the School of Architecture, School of Computer Science, Department of Civil and Environmental Engineering, Department of Mechanical Engineering, Human Computer Interaction Institute, Robotics, etc.

Approved courses may vary from year to year. Owing to periodic changes to the curricular offerings, students may, under the advice and of their Faculty Program Coordinator, and approval of the Graduate Program Committee, elect alternative courses to fit within this category.

Student must submit all petitions for course substitution or election in writing through the Faculty Program Coordinator to the Graduate Program Committee for approval.

Master of Science (M.S.) in Sustainable Design (12 month)

The Master of Science in Sustainable Design degree program provides an integrated education that strives to prepare its graduates for careers that will reshape the built environment in a sustainable fashion. This challenging program is intended for recent graduates and practicing professionals with degrees related to the built environment including architecture, landscape architecture, ecology, engineering, construction, interior architectural design, facilities management and others.

Year 1		**Fall**		**Spring**		**Summer**	
	Units	Number	Course	Number	Course	Number	Course
General	9	48.711	Research Models and Methods in Architecture (9)				
Core	48	48.722	Building Performance Modeling (12)	48.723	Performance of Advanced Building Systems (9)		
		48.737	Productivity, Health and the Quality of Buildings (9)	48.795	LEED Buildings and Green Design Concepts (9)		
		48.752	Zero Energy House (9)				
Core Selectives	27		1 Selective (9)		2 Selectives (18)		
Project	36			48.731	SD Synthesis PREP (12)	48.769	SD Synthesis (24)

Selective Categories

Students in the program must take one selective from each category. Courses listed under each category are only indicative. There may be other courses offered in other academic departments in the university, which are acceptable for fulfilling this requirement. Seek approval from the Faculty Program Coordinator.

Category 1 **Environmental Economics Tools and Calculations**		**Category 2** **Environmental Law and Policy**		**Category 3** **Sustainable Design and Development**	
Number	Course	Number	Course	Number	Course
12.712	Environmental Sustainability in Engineering (6)	90.702	International Environmental Law and Policy (12)	90.707	The Business of Brownfields (12)
12.715	Sustainable Case Studies (6)	79.365	Climate Change, Energy Policy and Environmental Protection (9)	90.789	Sustainable Community Development (12)
48.569	GIS and CAFM (9)	19.448	Science, Technology and Ethics (9)	CEE1210	Engineering and Sustainable Development (University of Pittsburgh; 3 credit hours) (9)
48.721	Building Controls and Diagnostic (12)				
73.248	Environmental Economics (9)				
73.358	Economics of the Environment and Natural Resources (9)				
90.779	Transportation Planning and Financing: Land use Impact (6)				

Degree Requirement

In addition to the standard requirements for all graduate students in the School of Architecture, students in this program must satisfy:

Students must complete a minimum of 120 units of course work for graduation with a minimum residency requirement of 2 academic semesters. Full-time status (minimum 36 units per semester) is required during the residency period.

Master of Urban Design (12 month)

The Master in Urban Design (MUD) is a 12-month degree program to develop physical design expertise critical to establishing new directions in sustainable community design and policy. Through a partnership with the Master of Public Policy and Management in Carnegie Mellon's Heinz School of Public Policy, the MUD prepares students to collaborate effectively in multidisciplinary teams to address the challenges and opportunities to revitalize neighborhoods, cities and regions.

Ensuring sustainability and quality of life in urban and regional design must be built on both multi-disciplinary expertise and participatory processes. Physical decisions about land-use, zoning, transportation and other infrastructures, mixed use development, and neighborhood design is brought together with urban geography, economics and policy in the Carnegie Mellon MUD degree. The center piece of the curriculum is the Urban Lab, a two term neighborhood analysis and design studio in which students from different disciplines work with architects, urban designers, the neighborhoods, and political and economic decision-makers, to address the complex and multidimensional nature of sustainable cities and regions.

		Fall		**Spring**		**Summer**	
	Units	Number	Course	Number	Course	Number	Course
Urban Lab	36	48.705	Urban Lab (18)	48.706	Urban Lab (18)		
Core	48	90.784	Geographical Information Systems (12)	48.453	Urban Design Theory (9)		
		90.743	Urban and Regional Economic Development (12)* OR	90.789	Sustainable Community Development (12)		
		90.711	Empirical Methods (12) * OR	48.707	Urban Design Thesis Prep (3)		
		90.710	Applied Economic Analysis for Public Policy and Management 12)*				
Elective	18		1 Elective (9-12 Units)		1 Elective (9-12 Units)		
			Examples:		Examples:		
		48.576	Mapping Urbanism (9)	48-725	Real Estate Design & Development (Graduate) (12)		
		90.765	Cities, Tech, Environment (12)	90.765	Cities, Tech, Environment (12)		
			Student proposed elective (9-12)		Student proposed elective (9-12)		
Project	24					48.708	Urban Design Synthesis (24)

Degree Requirement

In addition to the standard requirements for all graduate students in the School of Architecture, students in this program must satisfy:

- Students must complete a minimum of 126 units of course work for graduation.
- The minimum residency requirement is two academic semesters. Full-time status (minimum 36 units per semester) is required during the residency period.
- Students must start the sequence of courses in the Fall semester.

Collaborative degree with Oxford University MSc in Nature, Society and Environmental Policy program at Oxford University

Admission to Carnegie Mellon University's MUD program also carries the opportunity to apply for admission to the MSc in Nature, Society and Environmental Policy program at Oxford University, and achieve two overlapping Master degrees. The MSc is a three-term (12 month) program that aims to provide students with a broad perspective on society and the environment in the context of current debates on policy, regulation, social change, globalization, and environmental sustainability.

Students showing outstanding academic performance in the MUD program at Carnegie Mellon University can, if they wish, be recommended by their academic advisor for the MSc Program at Oxford University. Students are responsible for submitting the required application documentation to Oxford according to their deadlines. Students who are admitted to the MSc program by Oxford University will be able to waive the 24-unit summer thesis requirement at CMU, replaced by successful completion of the final thesis requirement for Oxford's MSc. Completed in residence in the final semester at Oxford, this thesis is expected to fulfill Oxford's academic requirements as well as address issues relevant in the context of the studio work developed in Pittsburgh. It is the responsibility of the student to make sure that the advisors in Oxford and Carnegie Mellon are aware of the topic selection and approve it as viable work to satisfy requirements in both institutions.

Successful completion of the Oxford program is a graduation requirement for students pursuing the double degree with the CMU thesis project replaced by the Oxford thesis. Academic transcripts or equivalent proof of completion and a copy of the thesis developed in Oxford should be submitted to Carnegie Mellon by August after completion of the Oxford degree. Because these are requirements for graduation in Carnegie Mellon, only after these documents are submitted can the student be certified for graduation with their MUD degree at CMU. If a student pursuing the double degree for any circumstance fails to complete the program in Oxford, she/he can always enroll in the summer thesis course at Carnegie Mellon to complete the MUD requirements for the award of the MUD degree.

6.3 _ Doctor of Philosophy (PhD) Programs

The School has a worldwide reputation for its leadership in fundamental research and innovative applications of design computing and building technology, and is a pioneer in computational design (computer-aided design and computer applications to building sciences) and building performance and diagnostics (performance evaluation and diagnosis of buildings).

The long established mission of the Doctor of Philosophy Program is to educate researchers capable of establishing the foundations of a research discipline in architecture. The program views architectural research as an integral component of the international scientific community.

The PhD degree is offered in **Building Performance and Diagnostics**, **Computational Design**, and starting in academic year 2007-08, **Architecture Engineering Construction Management** (offered jointly with the Civil and Environmental Engineering Department), for those who wish to specialize in research and to prepare for academic careers as well as leadership in industry and practice.

We continue to maintain consistent enrollment, relatively high level of funding and our graduates continue to be well placed in academia and industry. There are presently 36 PhD students of whom 29 are full time, 5 in absentia having completed their residency requirement, and 2 on leave of absence. The full time students are distributed as follows:

BPD: 15
CD: 12
AECM: 2 (currently in CD, pending approval from Civil and Environmental Engineering [CEE])

The strength of the program is its internationally renowned faculty who reflect a diverse set of backgrounds with a long-standing commitment to professional practice and scholarly research. Additionally, they engage in collaborative cross-specialization research and advising. The following full-time faculty serve or have served as principal advisors.

BPD: Volker Hartkopf, Khee-Poh Lam, Vivian Loftness
David Archer (visiting from Mechanical Engineering)
CD: Ömer Akın, Mark Gross, Ramesh Krishnamurti
AECM: Ömer Akın, Ramesh Krishnamurti and from CEE, Jim Garrett, Burcu Akinci
Susan Finger (courtesy appointment from CEE)

There is a major research facility, viz., Center for Building Performance and Diagnostics, designated by the National Science Foundation as an Industry/University Cooperative Research Center. The Advanced Building Systems Integration Consortium (ABSIC) a university-industry-government partnership supports its research. Other major sponsors include the National Science Foundation (NSF), the National Institute of Standards and Technology (NIST), the Pennsylvania Infrastructure Technology Alliance (PITA), the General Services Administration (GSA) and the US Army Corp's Civil Engineering Research Laboratory (CERL). Industry sponsors include Bosch and Autodesk.

(See 7.1 21st Century Research. 7.2 Research Specializations, and 7.3 Featured Research)

Overall, the 3 PhD programs have a unified curricular structure (shown in diagram). The course requirements for the PhD programs are derived from the corresponding Master's curriculum (described separately).

Despite successes and achievements, there are goals as well as needs remaining for the PhD program.

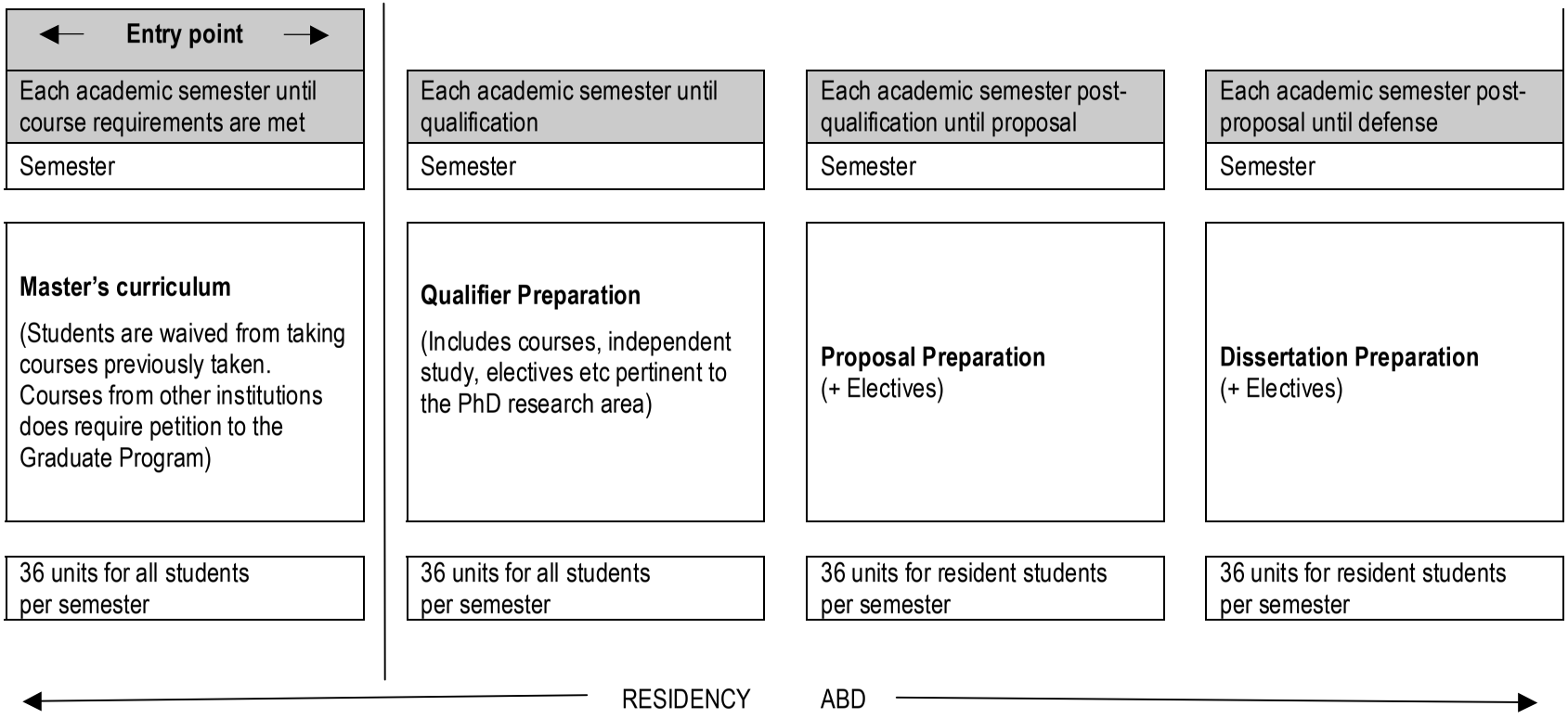
Goal:

Curricular Development/Revision/Refinement/Improvement
- To move the programs to reflect the State-of-the-Art
- Improved teaching/Teaching Assistant opportunities for graduate students

Needs:

Endowment for Graduate Student Scholarship and Support
- Including conference/workshop travel

OVERVIEW of PhD program ALL TRACKS



The Principal Advisor for a PhD student must be a qualified (as a PhD advisor) full-time faculty member in the School of Architecture.
A PhD student's committee (whether advisory, doctoral, or qualification examination panel) comprises at least 3 qualified faculty members including one from another School/Department.

International students (F1-visa holders) are considered **resident** for the duration of their stay in the US.
US nationals and Permanent Residents can go into ABS (absentia) status after completing residency requirement (minimum 2 years)
A candidate can remain in ABD (all but dissertation) status for no longer than 7 years.

Qualifier:	typically 1-3 years after entry	At least 72 hour written exam followed by a viva within 2 weeks before the examination committee
Proposal:	typically 1-2 years after qualifier	A written document including a timetable publicly presented before the doctoral committee
Defense:	typically 1-2 years after proposal	A written dissertation publicly presented and defended before the doctoral committee

6.4 _ PhD in Architecture Engineering Construction Management

Minimum Curricular Requirements for PhD students with prior MS in related area

COURSE REQUIREMENTS	TWO SEMESTERS (required courses in CEE and Architecture)		FOLLOWING YEARS	EXPECTED EFFORT (not a residency requirement)
	Core Courses	Advanced Courses	Independent work with advisors	
Research Seminar	9 units		Game Plan approval	1 semester
Quant. Meth., Micro-econ, Management	21 units	12 units		
Selectives (relevant university-wide courses)	12 units	30 units	Qualifier Examination; candidacy	1 semester
Proposal			Proposal Defense; ABD	1 semester
Dissertation			Dissertation Defense; graduation	3 semester
Total Units	42 units	42 units		

Minimum Curricular Requirements for PhD students with prior MS but not in related area

COURSE REQUIREMENTS	FIRST THREE SEMESTERS (required courses in CEE + Archit.)		FOLLOWING YEARS	EXPECTED EFFORT (not a residency requirement)
	Core Courses	Advanced Courses	Independent work with advisors	
Research Seminar	9 units		Game Plan approval	1 semester
Quantitative Methods, Micro-Economics, Management prerequisites	30 units			
Quant. Meth., Micro-econ, Management	21 units	12 units		
Selectives (relevant university-wide courses)	12 units	30 units		
Qualification			Qualifier Examination; candidacy	1 semester
Proposal			Proposal Defense; ABD	1 semester
Dissertation			Dissertation Defense; graduation	3 semester

6.4 _ PhD in Building Performance and Diagnostics

Year 1		**Fall**		**Spring**	
	Units	Number	Course	Number	Course
General	9	48.711	Research Models and Methods in Architecture (9)		
Core	21	48.722	Building Performance Modeling (12)	48.723	Performance of Advanced Building Systems (9)
Core Selectives	18		Selectives* (Fall or Spring)		
Computing / Alternatives	18		Recommended computing course** (Fall or Spring)		
		15.100	Introductory/Intermediate Programming (10) OR		
		15.200	Advanced Programming (9)		
Open Selections	9		Open Selections (Fall or Spring)		

Year 2		**Fall**		**Spring**	
	Units	Number	Course	Number	Course
Core	24	90.711	Empirical Methods for Public Policy and Management (12)+	90.722	Management Science I: Optimization and Multi-criteria Methods (6)+
		90.772	Operations Research for the Public Sector (6)+	90.760	Management Science II: Decision Risk Modeling (6)+
				48.721	Building Controls and Diagnostics (12)
Electives	15		Electives (Fall or Spring)*		
Project	36	48.702	Master's Project (18)+	48.703	Master's Project (var. 18-36)+

*Selectives are courses that are accepted as fulfilling the requirement of showing proficiency in aspects ot Building Performance and Diagnostics.
**Open selections enable students to take necessary prerequisites without extending the duration of their program. Students otherwise take elective(s) subject to approved by the Graduate Program Committee.
+Select 90-7110r any combination of 90-772, 90-722 and 90-760 for a total of 12 units.

Open Selections
Open selections enable students to take necessary prerequisite courses, which may be required for certain concentration selectives, without extending the duration of their program.
The following physics course is recommended for students wishing to pursue an interest in the area of energy and environmental policy:
24-721 Thermodynamics

Students pursuing performance simulation are encouraged to take 15-211 Fundamental Data Structures and Algorithms for which the following course is a mathematical prerequisite:
21-127 Concepts of Mathematics

There may be other more suitable prerequisites that meet the student's specific interest. Those courses can be elected, after consultation with the Principal Advisor.

Student must submit all petitions for course substitution or election in writing through the Principal Advisor to the PhD Program Committee for approval.

6.4 _ PhD in Computational Design

Year 1	Units	Fall Number	Fall Course	Spring Number	Spring Course
General	9	48.711	Research Models and Methods in Architecture (9)		
Computing	24	48.756	Building Performance Modeling (12)	48.770	Computation I; Introduction to Programming and Databases (12)
Project	24		MS(CD) Project Course I & II (Fall & Spring)		
Elective	12		Electives (Fall & Spring)		

Year 2	Units	Fall Number	Fall Course	Spring Number	Spring Course
Concentration Selectives	18		Concentrational Selectives* (Fall & Spring)		
Computing	24	15.211	Fundamentals of Data Structure and Algorithms (12)	15.212	Principles of Programming (12)+
Project	24		MS(CD) Project Course III & IV (Fall & Spring)		
Elective	12		Electives (Fall & Spring)		

*Selectives are courses that are accepted as fulfilling the requirement of showing proficiency in core aspects of Computational Design. Most selectives expect some programming skill as a prerequisite. Students without prerequisites should use the elective slot to take such courses without extending the duration of the program, e.g., 21-127 Concepts of Mathematics, is a prerequisite for 15-211.
+Completion of one or more of 15-212, 15-213 or 17-652 is required for candidacy in the PhD program in Computational Design.

Concentration Selectives
These concentration courses, subject to approval by the PhD Program committee, are accepted by the program as fulfilling the requirement of students showing proficiency in some aspects of Computational Design. These courses may be offered by the School of Architecture, School of Computer Science, Department of Civil and Environmental Engineering, Department of Mechanical Engineering, Human Computer Interaction Institute, Robotics, etc.

Approved courses may vary from year to year. Owing to periodic changes to the curricular offerings, students may, under the advice and approval of their Principal Advisor, and the PhD Program Committee, elect alternative courses to fit within this category.

7.0 Research, Awards, Grants

7.1 _ School of Architecture 21st Century RESEARCH _ AWARDS _ GRANTS

Principal	Title	Funding Agency	Amount
2000			
Cooper, Doug	San Francisco Mural Project	H. M. Bitner	$5,000
Cooper, Doug	San Francisco Mural Project	CMU - Indira Nair	$15,000
Cooper, Doug	San Francisco Mural Project	Lucius and Eva Eastman Fund	$5,000
Flemming, U.; Akin,	SEED Collaborative	US Army CERL	$90,240
Flemming, Ulrich	The SEED Experience	CERL	$73,288
Flemming, Ulrich	Component Integration	Lockheed	$25,000
Flemming, Ulrich	Object-Oriented Application Development in Computer-Aided Design	PITA / Bentley	$40,000
Hartkopf, Volker	Birkenfeld Project	Rhein-Pfalz Wohnen GmbH	$34,165
Lee, Stephen	Evaluation of Integrated Wall Systems Incorporating Electrochromic Windows	SAGE	$32,000
Lee, Stephen	DGS Project	Conservation Consultants	$41,560
Loftness, Vivian	Adaptable Workplace Laboratory	GSA	$723,000
Loftness, Vivian	Energy Savings Potential of Flexible and Adaptive HVAC Distribution Systems	ARTI	$25,000
Loftness, Vivian	Technical and Professional Assistance for the Advancement of Environmental	Heinz Endowments	$30,000
Loftness, Vivian	Multi-partite Strategic Planning Discussions on Energy Efficient Projects	Rand DOE	$50,000
Loftness, Vivian	Green Building Alliance	Heinz Endowments	$34,779
Mahdavi, Ardeshir	SEMPER	NIST	$35,000
Oppenheim, Irving	MEMS Device for Detecting Cracks or Weld Failures	PITA	$39,000
Oppenheim, Irving	MEMS Devices for Ultrasonic NDE	Krautkramer	$10,000
			$1,308,032
ABSIC 2000			
Hartkopf, Volker	ABSIC	Steelcase	$50,000
Hartkopf, Volker	ABSIC	Johnson Controls	$30,000
Hartkopf, Volker	ABSIC	Teknion	$50,000
Hartkopf, Volker	ABSIC	Armstrong	$30,000
Hartkopf, Volker	ABSIC	EDF	$39,950
Hartkopf, Volker	ABSIC	Dutch Government	$49,982
Hartkopf, Volker	ABSIC	BP Solar	$50,000
Hartkopf, Volker	ABSIC	Public Works GS Canada	$50,000
Hartkopf, Volker	ABSIC	Zumtobel	$100,000
Hartkopf, Volker	ABSIC	Steelcase	$50,000
Hartkopf, Volker	ABSIC	State Department	$50,000
Hartkopf, Volker	ABSIC	DoD	$50,000
Hartkopf, Volker	ABSIC	State Department	$50,000
		ABSIC 2000	**$599,932**
		TOTAL 2000	**$1,907,964**
2001			
Akin, Omer	arc.cite.net	University Computing	$10,000
Cooper, Doug	Rome Mural Project	CMU - Indira Nair	$15,000
Ramesh	ITR/IM	NSF	$255,822
Ramesh	Digital Narratives	International Committee	$10,000
Ramesh	A Networked Environment for Education, Learning and More	CMU - OTE	$10,000
Lee, Stephen	Educational Seminars to GSA	NIBS	$41,846
Lee, Stephen	Assistance in Architectural Input to RFP Processes for Charlottetown GOCB	PWGSC	$14,297
Lee, Stephen	Solar Decathlon 2002	NREL	$5,000
Loftness, Vivian	Building Projects in Pittsburgh	Heinz Endowments	$50,000
Mahdavi, Ardeshir	Oakridge	UT Batelle	$47,848
Oppenheim, Irving	MEMS Device for Detecting Cracks or Weld Failures	PITA	$85,000
			$544,813

ABSIC 2001			
Hartkopf, Volker	ABSIC	DoD	$50,000
Hartkopf, Volker	ABSIC	EDF	$50,000
Hartkopf, Volker	ABSIC	Thyssen	$50,000
Hartkopf, Volker	ABSIC	Carnegie Mellon	$50,000
Hartkopf, Volker	ABSIC	Armstrong	$30,000
Hartkopf, Volker	ABSIC	Zumtobel	$50,000
Hartkopf, Volker	ABSIC	BP Solar	$50,000
Hartkopf, Volker	ABSIC	Teknion	$50,000
Hartkopf, Volker	ABSIC	Public Works GS Canada	$50,000
Hartkopf, Volker	ABSIC	Steelcase	$30,000
		ABSIC 2001	**$460,000**
		TOTAL 2001	**$1,004,813**

2002			
Akin, Omer	Product/Process Modeling in BCx	NIST	$109,946
Cooper, Doug	Rome Mural Project	H.M. Bitner Charitable Trust	$1,000
Cooper, Doug	Rome Mural Project	Roy A. Hunt Foundation	$10,000
Krishnamurti, R;	StudioX: IT Enhanced Learning Environments: Supporting Multidisciplinary	OTE	$37,000
Loftness, Vivian	Tech and Professional Assistance for the Advancement of Environmental	Heinz Endowments	$50,000
Loftness, Vivian	BIDS (Building Investment Decision Support)	Pentagon	$6,500
Loftness, Vivian	GSA Integrated Workplace	GSA	$85,000
Loftness, Vivian	Cornerstones Symposium	Heinz Endowments	$5,000
Oppenheim, Irving	MEMS Device for Detecting Cracks or Weld Failures	PITA	$31,230
Oppenheim, Irving	REU Supplement: Piezoelectric Power Scavenging	NSF	$7,000
Shaw, Diane	Multi-disciplinary Course	CMU - Indira Nair	$6,900
			$342,676

ABSIC 2002			
Hartkopf, Volker	ABSIC	DoD	$50,000
Hartkopf, Volker	ABSIC	BP Solar	$50,000
Hartkopf, Volker	ABSIC	UTRC	$50,000
Hartkopf, Volker	ABSIC	EDF	$50,000
Hartkopf, Volker	ABSIC	Thyssen	$50,000
Hartkopf, Volker	ABSIC	NWEEA	$50,000
Hartkopf, Volker	ABSIC	Dutch Government	$50,000
		ABSIC 2002	**$350,000**
		TOTAL 2002	**$692,676**

2003			
Akin, Omer	Building Commissioning Data Exchange Grant	NIST	$109,946
Akin, Omer	CaveCad	CMU - OTE	$8,214
Akin, O.;Garrett, J.	Moisture Monitoring: Roofing w/ Nanosensors	PITA	$20,000
Bartos, Stephannie	Barrier-Free Architecture in Vietnam	Vietnam Assistance for	$17,200
Lee, Laura	First Year Studio Woodshop Project	Enkeboll Foundation	$10,000
Lee, Stephen	Sustainable Design Services for the Fjardaal Smelter Project	Alcoa	$50,000
Loftness, V.;	Case Studies: Landscape Character Protection of Western Pennsylvania	Heinz Endowments	$47,000
Loftness, Vivian	BIDS II	Lawrence Berkeley Labs	$70,533
Loftness, Vivian	Tech and Professional Assistance for the Advancement of Environmental	Heinz Endowments	$50,000
Loftness, Vivian	IAQ Needs	CIEE	$15,000
Loftness, Vivian	Cornerstones Symposium	Heinz Endowments	$10,000
Mondor, Christine	Course Development	Luce Foundation 9500	$9,500
Oppenheim, Irving	RFID Technology for Infrastructure Monitoring	PITA	$49,706
Oppenheim, Irving	MEMS for Multi-Mode Infrastructure Monitoring	NSF	$32,000
Oppenheim, Irving	Guided Waves for Plate Monitoring, Phase I	Bosch	$32,260
			$531,359

ABSIC 2003			
Hartkopf, Volker	ABSIC	GSA	$50,000
Hartkopf, Volker	ABSIC	Steelcase	$30,000
Hartkopf, Volker	ABSIC	UTRC	$50,000
Hartkopf, Volker	ABSIC	Public Works GS Canada	$50,000
		ABSIC 2003	**$180,000**
		TOTAL 2003	**$711,359**

2004			
Akin, Omer	Building Commissioning Data Exchange Grant	NIST	$100,000
Akin, Omer	Development and Use of an Automated Test Rig for Assessing the Effectiveness	NIST	$99,902
Akin; Krishnamurti	NSF Grant for High-performance Laser Scanner	NSF	$200,000
Akin, O.; Garrett, J.	Moisture Monitoring: Roofing w/ Nanosensors	PITA	$41,551
Bartos, Stephannie	Innovations in Architectural Infill	NCIIA Lemelson Foundation	$15,000
Do, Ellen	Thinking With Your Hands	PITA	$48,000
Hartkopf, Volker	Advanced Building Efficiency Testbed	DOE	$966,000
Krish; Kurland; Rico	3d Visualization for the Urban Laboratory	CMU - Steinbrenner	$5,000
Lam, Khee Poh	Energy Modeling Tools for Early Conceptual Design	NWEEA	$27,367
Lam, Khee Poh	Planning Grant	Children's Hospital Foundation	$25,000
Lee, Laura	Mobile Interior Environments	Enkeboll Foundation	$50,168
Lee, Stephen	Sustainable Design Services for the Fjardaal Smelter Project	Alcoa	$10,000
Lee, Stephen	Solar Decathlon 2005	NREL	$5,000
Lee, Stephen	Sustainable Design Services for the Fjardaal Smelter Project	Alcoa	$10,000
Lee, S.; Lam, KP	Development of High Latent Effectiveness Energy Recovery Ventilator with	UTRC	$30,000
Lewis, David	Urban Lab Publication	Pgh Foundation	$5,000
Lewis, David	Urban Lab Publication	McCune Foundation	$5,000
Loftness, Vivian	GSA 20/20	GSA	$290,400
Loftness, Vivian	Cornerstones Symposium	Heinz Endowments	$10,000
Loftness, Vivian	Technical Assistance Project	Heinz Endowments	$50,000
Oppenheim, Irving	MEMS for Multi-Mode Infrastructure Monitoring	NSF	$107,000
Oppenheim, Irving	Frangible Tilt-Down Tower	FAA	$50,000
Oppenheim, Irving	CMOS Sensor for Chloride Monitoring	PITA	$45,506
Oppenheim, Irving	Guided Waves for Plate Monitoring, Phase II	Bosch	$59,284
Smith, Scott	Design Build Deck Project	Silver Eye Gallery	$10,000
Snyder, Megan	Green Roof	CMU - Steinbrenner	$9,911
			$2,275,089

ABSIC 2004			
Hartkopf, Volker	ABSIC	Gale Foundation	$30,000
Hartkopf, Volker	ABSIC	NWEEA	$25,000
Hartkopf, Volker	ABSIC	UTRC	$50,000
		ABSIC 2004	**$105,000**
		TOTAL 2004	**$2,380,089**

2005			
Akin, Omer	Building Commissioning Data Exchange Grant	NIST	$100,000
Akin, Omer	Development and Use of an Automated Test Rig for Assessing the Effectiveness	NIST	$99,902
Akin, O; Akinci, B,	An Integrated Approach for Interpreting and Fusing Building and Mobile Sensor S	NIST	$150,000
Archer, D.;	DoD Participation in the IWESS	NIBS	$100,000
Aziz, A.; Hartkopf,	SEER	CMU - Steinbrenner	$10,000
Docter, Kelly	Architecture Explorations: K-12 Outreach	American Arch. Foundation	$2,500
Docter, Kelly	Architecture Explorations: K-12 Outreach	Roy A. Hunt Foundation	$5,000
Gross, Mark	Computational Construction Kits / Craft	NSF	$198,000
Gutschow, Kai	Architecture Restoration of Carved Wood Interior (ARC) I - Research	Enkeboll Foundation	$23,000
Gutschow, Kai	Architecture Restoration of Carved Wood Interior (ARC) II - Analysis	Enkeboll Foundation	$23,000
Hartkopf, Volker	Advanced Building Energy Testbed	DOE	$723,000
Lam, KP; Hartkopf,	Integrated Concurrent Design of High Efficiency Commercial	NIST / UTC Grant	$410,000

Lam, Khee Poh	Assessment of Physical and Computational Airflow Analysis and Evaluation Tools	Konstrukt	$10,103
Lee, Laura	Case Studies of Wood-Carved Interiors, parts 1 and 2	Enkeboll Foundation	$46,000
Lee, Stephen	Solar Decathlon	CMU - Steinbrenner	$10,000
Lee, Steve	Solar Decathlon	Ford Motor Company	$155,000
Lee, Steve	Solar Decathlon	P3	$10,000
Lee, Steve	Solar Decathlon	Heinz Foundation	$25,000
Loftness, Vivian	Urban Lab: Planning Grant for Remaking Cities	Heinz Foundation	$50,000
Loftness, Vivian	Research Publication for AIA on BIDS	American Institute of Architects	$4,000
Loftness, Vivian	Cornerstones Symposium	Heinz Foundation	$10,000
Loftness, Vivian	Technical Assistance Project	Heinz Foundation	$50,000
Loftness, Vivian	BIDS (Building Investment Decsion Support)	Konstruct	$25,000
Oppenheim, Irving	MEMS for Multi-Mode Infrastructure Monitoring	NSF	$107,000
Oppenheim, Irving	FAA Frangible Base for Tilt-Down Tower	FAA	$25,000
Oppenheim, Irving	Guided Waves for Plate Monitoring, Phase III	Bosch	$69,000
Smith, Scott	Model Making of Wood Barns in Western Pennsylvania	Carnegie Museums	$3,000
			$2,443,505
ABSIC 2005			
Hartkopf, Volker	ABSIC	Steelcase	$30,000
Hartkopf, Volker	ABSIC	UTRC	$50,000
Hartkopf, Volker	ABSIC	NWEEA	$25,000
		ABSIC 2005	**$105,000**
		TOTAL 2005	**$2,548,505**
2006			
Akin, Omer	NSF Workshop	NSF	$54,000
Akin, Omer	Embedded Commissioning of Low Energy Buildings	NIST	$150,000
Akin, O; Akinci, B,	Streams…	NIST	$150,000
Archer, D.;	Advanced Building Energy Testbed Initiative	DOE NETL	$990,000
Archer, D.;	Advanced Building Energy Testbed Initiative	PA Dept Energy Harvest	$120,000
Archer, D.;	Advanced Building Energy Testbed Initiative	PA Dept PEDA	$167,000
Archer, David	RDS	RDS	$10,246
Docter, Kelly	Architecture Building Communities, Latrobe	McFeely Rogers Foundation	$10,000
Docter, Kelly	Architecture Explorations: K-12 Outreach	American Arch. Foundation	$1,500
Docter, Kelly	Architecture Explorations: K-12 Outreach	Grable Foundation	$5,000
Gross, Mark	Science of Design CBA: Summer School	NSF	$130,000
Gross, Mark	ITR: Construction kits & craft	NSF	$178,821
Gutschow, Kai	e-Folios for Architects (Nuventive "i-Webfolio" software test)	CMU - OTE	$12,000
Hutzell, K.; Lee, L	Globalizing Education at CMU: Mapping Urbanism	CMU - Indira Nair	$15,000
Kurland, Kristen	Diabetes Prevention and Treatment Programs for Western Pennsylvania	Children's Hospital / DoD	$25,000
Kurland, K. et al.	Designing a Healthy Community	Highmark Blue Cross	$11,000
Krishnamurti,	Predicting Interior Layouts of Buildings	Army	$109,172
Krishnamurti,	Enhancement of the Characterization of Building Facilities	Army	$14,430
Krishnamurti,	CAD for Sustainable Building	AutoDESK	$600,000
Lam, Khee Poh	Impact of Shading Control Strategies	Somfy	$24,000
Lam, Khee Poh	occupancy status	Bosch	$35,000
Lam, Khee Poh	occupancy status	Bosch	$25,000
Lam, Khee Poh	cooperative agreement Graduate Internship	UTRC	$12,078
Lee, Laura	Cornerstones Symposium 2006	Heinz Foundation	$10,000
Lee, Laura	Cornerstones Symposium 2006	Roy Hunt Foundation	$1,000
Lee, Laura	Cornerstones Symposium 2006	McCuneFoundation	$5,000
Lee, Stephen	Solar Decathlon 2007	NREL	$100,000
Lee, Stephen	Solar Decathlon 2007	DAAD	$7,500
Loftness. V.; Aziz,	NEAT 20/20	GSA	$351,010
Loftness, Vivian	Energy Efficient Building Retrofits	NAESCO	$19,250
Loftness, Vivian	House Science Committtee Project	AOC/Entech	$24,500
Loftness, Vivian	Architect of the Capitol - Annual Report	AOC/Entech	$106,911

Oppenheim, Irving	MEMS for Multi-Mode Infrastructure Monitoring	NSF	$70,000
Oppenheim, Irving	MEMS AE Sensor for Field Test Application	PITA	$54,544
Oppenheim, Irving	Flaw Detection in Monitoring Construction	Bombardier / PITA	$48,000
Oppenheim, Irving	Wireless Remote Structural Monitoring System	TRB	$20,000
Oppenheim, Irving	Characterization of Chlorine and Chloride Sensors	PITA	$47,333
Luis	Strategies for the Reuse of Vacant Urban Land	Urban Land Institute	$18,000
			$3,732,295

ABSIC 2006			
Hartkopf, Volker	ABSIC	SSI	$50,000
Hartkopf, Volker	ABSIC	Trane	$50,000
Hartkopf, Volker	ABSIC	UTRC	$50,000
		ABSIC 2006	**$150,000**
		TOTAL 2006	**$3,882,295**

2007			
Akin, Omer	CMU - Center for the Arts in Society	CMU - CAS	$2,000
Akin, Omer	Embedded Commissioning of Low Energy Buildings	NIST	$150,000
Akin, Omer	Big Q	CMU - Indira Nair	$2,000
Akin, O; Akinci, B,	Streams…	NIST	$150,000
Archer, D.; Hartkopf	DoD Participation in the IWESS	NIBS	$50,000
Aziz, A.	NEAT Cart	Edo Rocha	$10,000
Damiani	Student Design Competition in Concreate Masonry	Masonry Association)	$7,050
Docter, Kelly	Architecture Building Communities	NEA	$20,000
Docter, Kelly	Architecture Explorations at Fallingwater	Buhl Foundation	$5,000
Docter, Kelly	Architecture Building Communities	Grable Foundation	$5,000
Gross, Mark	Unrestricted research support	RICOH	$10,000
Gross, Mark	ITR: Construction Kits & Craft	NSF	$153,463
Gross, Mark	STEM	National Science Foundation	$135,339
Hartkopf, Volker	ITEST	Siemens	$75,000
Hutzell, K.; Lee, L	Globalizing Education at CMU: Mapping Urbanism	CMU - Indira Nair	$15,000
Kline, Jonathan	Re-envisioning the (Pittsburgh) Region	Grable Foundation	$45,000
Lam, Khee Poh	ITEST - Grad students and equipment	Bosch	$50,000
Lee, Stephen	Solar Decathlon 2007	WPPSEF	$25,000
Lee, Stephen	Solar Decathlon 2007	Heinz Foundation	$25,000
Lee, Stephen	Solar Decathlon 2007	Hunt Foundation	$25,000
Lee, Stephen	Solar Decathlon 2007	PPG	$15,000
Lee, Stephen	Solar Decathlon 2007	SEER	$7,500
Lee, Stephen	Solar Decathlon 2008	Master Builders Assocation	$7,500
Loftness, Vivian	Architect of the Capitol - Annual Report	AOC/Entech	$28,603
Loftness, Vivian	Dirksen Roof Project	AOC/Entech	$26,000
A.	NEAT 20/20	GSA	$100,000
Oppenheim, Irving	MEMS for Multi-Mode Infrastructure Monitoring: Goali Supplement	NSF	$37,000
Luis	Big Q	CMU - Indira Nair	$2,000
Luis	Remaking Cities Instiute LTV Hazelwood	Heinz Foundation	$300,000
		To Date	**$1,483,455**

ABSIC 2007			
Hartkopf, Volker	ABSIC	GSA	$100,000
Hartkopf, Volker	ABSIC	UTRC	$50,000
Hartkopf, Volker	ABSIC	SSI	$50,000
Hartkopf, Volker	ABSIC	American Standard	$50,000
Hartkopf, Volker	ABSIC	Alcoa	$75,000
		ABSIC 2007 to date	**$325,000**
		TOTAL 2007 to date	**$1,808,455**

2008			
Akin, Omer	Embedded Commissioning of Low Energy Buildings	NIST	$50,000
Gross, Mark	ITR: Construction Kits & Craft	NSF	$153,463

7.2 _ Research Specializations and Featured Projects

Omer Akin, PhD
Design Cognition
Computer Aided Requirement Management
Advanced Infrastructure Systems
Case Based Decision Support Systems
Augmented Reality
Functionalizing Product and Process models for Embedded Commissioning of Low Energy Buildings
An Integrated Approach for Interpreting and Fusing Building and Mobile Sensor Streams in a Facility into High-Level Information

Mark Gross, PhD
Computational Design
Design Theory and Methods
Human-Computer Interaction for Design
Computational Support for Sketching
Computational Construction Kits and Craft
Science of Design: Summer Workshop

Volker Hartkopf, PhD
David Archer, PhD, PE
Building Performance
Advanced Building Systems/Advanced Technologies
Energy and Environment
Sustainability
Advanced Building Efficiency Testbed, Intelligent Workplace Energy Supply System (IWESS)

Ramesh Krishnamurti, PhD
Visual Thinking, Visual Computing, Spatial/Temporal Reasoning and Languages
Generative Systems
Knowledge Based Design
Computer-aided design - Product Modeling, Decision Support Systems, Product Data Interchange
Digital Design - Representation and Visualization
Process Simulation
User Interface Design
Computing Paradigms
Human-Machine Interaction Design
Sustainable Building Applications
Computer Aided Design for Sustainable Building
PILOT: Predicting Interior Layouts Over building Types
ITR/IM+AP adsmCon: Early Detection and Management of Defects at Construction Sites
Using Integrated Project Models, Laser Scanners and Embedded Sensor Systems

Kristen Kurland
Diabetes Prevention and Treatment Programs for Western Pennsylvania

Khee Poh Lam, PhD, RIBA
Building Performance Modeling
Occupant and Environmental Sensing and Controls
Integrated Concurrent Design of High Efficiency Commercial Buildings

Steve Lee, AIA, LEED AP
Advanced Building Systems / Advanced Technologies
Energy and Environment
Sustainability / Sustainable Housing

Vivian Loftness, FAIA, LEED AP
Azizan Aziz, LEEP AP
Building Performance
Advanced Building Systems/Advanced Technologies
Energy and Environment
Sustainability
POE (Post Occupancy Evaluation)
Health and Productivity
Buillding Investment Decision Support (BIDS) Health and Productivity
National Environment Assessment Toolkit (NEAT/POE)

Irving Oppenheim, PhD, PE
MEMS (micro-electro-mechanical systems) Devices for Structural Sensing

Ömer Akın, PhD, RA

Project Title:
Functionalizing Product and Process models for Embedded Commissioning of Low Energy Buildings

Grantor or Sponsor:
NIST (National Institute of Standards and Technology)

Principal Investigator:
Ömer Akın

Co-investigators:
Burcu Akıncı and James Garrett

Budget / award:
$300,000

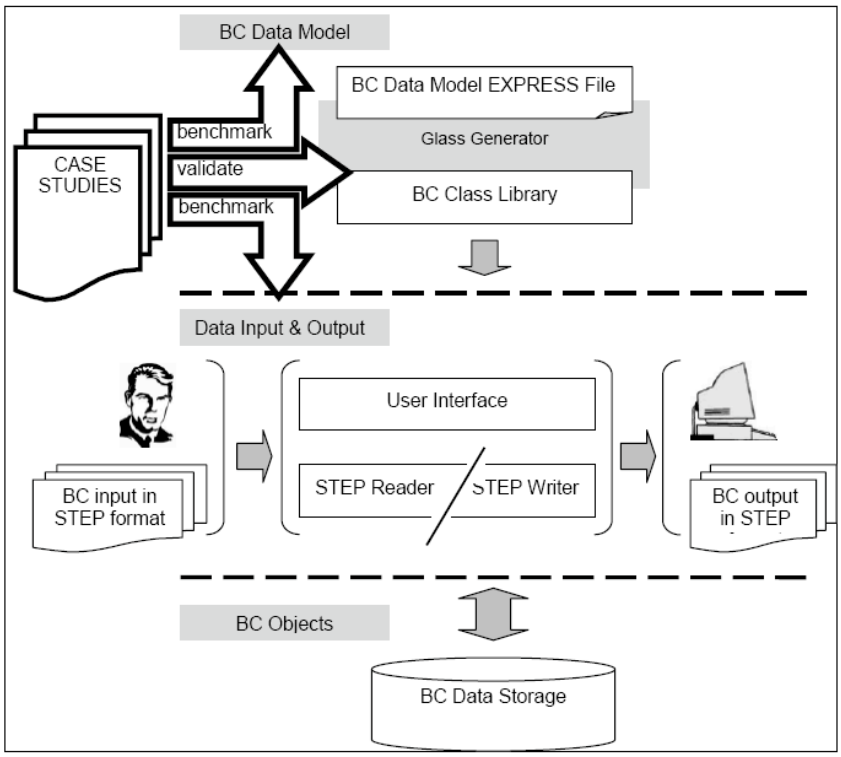
Project start date / Project end date:
September 2006; September 2008

Key words:
Building Operations and Management
Building Information Systems
Product Modeling
Process Modeling
Building Commissioning
Embedded Commissioning
Low Energy Buildings

Project Web site:
We use the LIRE system developed at Carnegie Mellon University for internal communication of researchers and version management of research documents. The site is at http://lire.ices.cmu.edu/lire/ but access to outsiders is restricted.

Abstract:
IEA Annex 47, which is the umbrella organization into whose mission this project fits, has been working to enable the effective commissioning of existing and future buildings to improve their operating performance. The commissioning techniques developed will help transition the industry from the current intuitive approach to building operation to more systematic operation that focuses on energy savings. In this context, our work is defined by the first mission of ANNEX47 which is: the "initial commissioning of advanced and low energy building systems."

Project Summary:
We define our work through three sub-tasks: a) definition of the information flow in the commissioning process; b) definition of an information model that supports the input and output of information within this flow; and c) the definition of a series of functional performance tests (FPTs) for the various systems of low energy buildings, such as heating systems, lighting systems, ventilation systems, etc. These FPTs will be contributed by the group of international members participating in ANNEX 47. Once these FPTs are defined, the plan is to clearly define the necessary inputs (data) to perform the FPTs and the outputs (data) produced in conducting the FPTs. As part of the process of developing this information flow, it is necessary to determine which of these outputs needs to be exchanged with other parts of the information flow. We propose to define the information model necessary to support the exchange of information as FPTs are conducted and model a significant set of FPT processes as applications based on the model. As the Industry Foundation Classes (IFCs) are a data exchange standard that has seen extensive investment and development in the AEC industry, ANNEX 47 must seek to take maximal advantage of this standard and influence the extension of the IFC standard to better support the information that needs to be exchanges concerning these FPTs. Thus, the last part of this proposed work is to explore in what ways the IFCs need to be extended to support the exchange of the information contained in the developed information model for supporting the FPTs.



List of key project publications:

Post-award Publications:

Ömer Akın, Kwang Jun Lee, Asli Akcamete, Burcu Akıncı, and James Garrettt, Jr. "Product and process modeling for functional performance testing in low-energy building embedded commissioning cases" ICEBO Conference, San Francisco, November 1-3, 2007

Tanyel Turkaslan-Bulbul and Ömer Akın "Computational Support for Building Evaluation: Embedded Commissioning Model" in Journal of Automation in Construction, 15 (2006) 438-447

Ömer Akın and Tanyel Turkaslan-Bulbul "Evaluation Methods for Building Product Models: Measuring the Performance of Building Commissioning Data Model" American Society of Civil Engineers – Computing Conference, Carnegie Mellon University, Pittsburgh, PA

Pre-award Publications (leading to the proposal):

Tanyel Türkaslan-Bulbul and Ömer Akın "Computational Support for Building Evaluation: Embedded Commissioning Model" in Proceedings of the Future of the AEC Industry Conference sponsored by the Building Futures Conference, Las Vegas, March, 2005

Ömer Akın and Tanyel Türkaslan-Bulbul "A review of building product models in AEC industry towards a model for building commissioning" in Proceedings of the 3rd International Conference on Innovation in AEC, Rotterdam, The Netherlands (2005)

Ömer Akın and Sanghoon Lee "The virtual-augmented-reality environment for building commission: case study," Proceedings of ICEBO 2005 Conference, Pittsburgh, PA, USA, October 15-17, 2005

Ömer Akın and İpek Gürsel"Linking Building Commissioning and Operations and Maintenance towards an Embedded Commissioning Practice," in Proceedings of ICEBO 2005 Conference, Pittsburgh, PA, USA, October 15-17, 2005

Other (miscellaneous) information about the project:

Since the involvement of the PI in the ANNEX 47 project he has been appointed the leader in Subtask A1 of ANNEX 47, which deals with the development of international standards for product and process modeling for Building Commissioning.

Ömer Akın, PhD, RA

Project Title:
An Integrated Approach for Interpreting and Fusing Building and Mobile Sensor Streams in a Facility into High-Level Information

Grantor or sponsor:
NIST (National Institute of Standards and Technology)

Principal Investigator:
Burcu Akinci

Co-investigators:
Ömer Akın and James Garrett

Other institutional or corporate partners:
None

Budget / Award:
$300,000

Project start date / Project end date:
September 2005; September 2007 [no cost extension till September 2008]

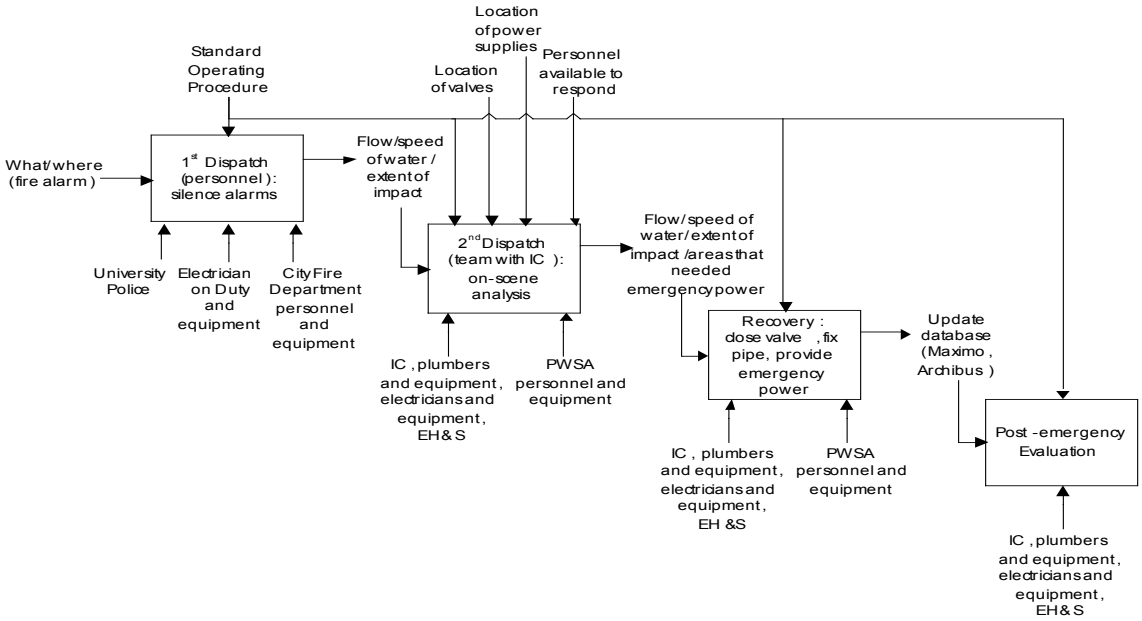
Key words:
Emergency Response
First Responders
Operations and Management Staff
Facility Vulnerability
Augmented Reality
Flood Case Studies

Project Web site:
We use the LIRE system developed at Carnegie Mellon University for internal communication of researchers and version management of research documents. The site is at http://lire.ices.cmu.edu/lire/ but access to outsiders is restricted.

Abstract:
This project is to develop strategies and digital decision support tools to help first responders as well as maintenance and operations staff to cull information form a wide range of sources in attending to emergencies, in the first case, and to daily maintenance tasks, in the latter. This is based on the recognition that (1) building information is rich but distributed; (2) difficulties are due to poor information access; and (3) both daily maintenance and emergency situations can benefit from tools that harvest this information.

Project summary:
Our approach is based on the recognition that (1) building information is rich but distributed among different formats and sources – data bases, infrastructure information repositories, sensors and other passive/active data devices, system control and management protocols and the like; (2) difficulties and inefficiencies are often due to not having access to this information just-in-time; and (3) both daily maintenance and emergency situations can benefit from similar tools that harvest this information in a purposeful way.
The specific objectives of the project are:

(1) To develop use-case scenarios representative of multiple-users (the principal users of our research focus: facility managers and first responders) of an integrated continuous commissioning model of a facility.
(2) To explore the current state of monitoring and diagnostic approaches and the degree to which they have been effectively deployed in building commissioning-oriented applications.
(3) To explore different sensor systems and tracking devices, such as RFID, to support the use cases that will be developed.
(4) To explore and develop approaches that will fuse the data from multiple sensing sources.
(5) To develop approaches that will interpret the data collected from a variety of sensors into higher-level information items and will integrate these information items into an integrated continuous commissioning model of a facility.
(6) To test this model in the context of our use-cases (objective 1).



IDEF-0 Diagram showing the Flow of Events during the Mellon Institute Flood Emergency

List of key project publications:

Post-award Publications:

Ömer Akın, Burcu Akıncı, James Garrett, Tanyel Bulbul, Sanghoon Lee, and Hongjun Wang "Embedded Commissioning for Improved Building Decision Support" ICEBO Conference, Shen Zhen, China, November 5-6, 2006

Ömer Akın and Tanyel Türkaslan-Bulbul "A review of building product models in AEC industry towards a model for building commissioning" in Proceedings of the 3rd International Conference on Innovation in AEC, Rotterdam, The Netherlands (2005)

Ömer Akın and Sanghoon Lee "The virtual-augmented-reality environment for building commission: case study," Proceedings of ICEBO 2005 Conference, Pittsburgh, PA, USA, October 15-17, 2005

Ömer Akın and İpek Gürsel"Linking Building Commissioning and Operations and Maintenance towards an Embedded Commissioning Practice," in Proceedings of ICEBO 2005 Conference, Pittsburgh, PA, USA, October 15-17, 2005

Pre-award Publications (leading to the proposal):

Tanyel Türkaslan-Bulbul and Ömer Akın "Computational Support for Building Evaluation: Embedded Commissioning Model" in Proceedings of the Future of the AEC Industry Conference sponsored by the Building Futures Conference, Las Vegas, March, 2005

Mark Gross, PhD

Project Title:
Computationally Enhanced Construction Kits and Craft: Integrating Tangible and Computational Media for Construction and Design

Grantor or Sponsor:
National Science Foundation

Principal Investigator (at CMU):
Mark D Gross

Co-investigators (& affiliations if not CMU-SoA):
Michael Eisenberg, University of Colorado

Budget / award (total over project period, all co-investigators):
$1.8M

Project start date / Project end date
September 2003; August 2008

Key words:
construction kits
embedded computing
sensors
design education
digital craft

Project Web site:
http://code.arc.cmu.edu/lab/html/projects.html#projects_computational_construction_kits_and_craft

Abstract:
Construction toys for building physical models have played a powerful role in children's lives. Traditional constructions tend to be aesthetically and behaviorally limited. Through embedded computation, kit pieces may communicate with *each other*, *desktop machines*, and *users*. By integrating construction kits with computation, their power and expressiveness can be increased.

Project Summary:
Construction kits—toys designed for the building or assembly of physical models—have historically played a powerful educational role in children's lives. Viewing the landscape of these kits—geometric design sets, erector sets, architectural blocks, anatomical models, chemical modeling kits, and so forth—we can see manifest strengths: at their best, they permit children to design and build three-dimensional models and to learn through tactile experience. Nonetheless, traditional construction kits also have striking limitations. They offer little in the way of direct communication with their users—for example, a traditional kit cannot offer a student information or advice about how to proceed in building a model, and as a result, crucial opportunities for student reflection may be lost. Perhaps even more importantly, traditional constructions—i.e., the models produced—tend to be aesthetically and behaviorally limited. This proposal argues that through the use of embedded computation, pieces within a construction kit may communicate with *each other*, with *desktop machines*, and with their *users*; and overall, by integrating construction kits with computation, the educational power and expressiveness of these kits can be greatly increased.

List of key project publications (reports, published papers, etc.):

Gross, M. and Eisenberg, M. [2007] "Why Toys Shouldn't Work 'Like Magic': Children's Technology and the Values of Construction and Control" In Proceedings of the First IEEE International Workshop on Digital Game and Intelligent Toy Enhanced Learning (DIGITEL 2007), Taipei, Taiwan, March 2007, pp. 25-32. (Best paper award nomination.)

Schweikardt, E. and Gross, M.D., A Brief Survey of Distributed Computational Toys. in DIGITEL 2007: The First IEEE International Workshop on Digital Game and Intelligent Toy Enhanced Learning, (Jhongli, Taiwan, 2007).

Weller, Michael and Do, Ellen Yi-Luen, Architectural Robotics: A New Paradigm for the Built Environment, Proc. EuropIA, Montreal, CA, September 2007.

Gross, M.D. and Do, Y-L. "Environments for Creativity – A Lab for Making Things" Proceedings, Creativity and Cognition 2007, ACM SIGCHI, pp. 27-36.

Oh, Y., K. Camarata, M. Weller, M. D. Gross and E. Y.-L. Do (2006). TeleTables and Window Seat: bilocative furniture interface Ubiquitous Computing: Design, Implementation, and Usability Y.-L. T. a. H. Duh.

Schweikardt, E. and Gross, M.D. roBlocks: A Robotic Construction Kit for Mathematics and Science Education International Conference on Multimodal Interaction, Banff, Alberta, Canada, 2006.

Eng, Markus, Ken Camarata, Ellen Yi-Luen Do, Mark D Gross, FlexM: Designing a Physical Construction Kit for 3D Modeling", (2006) International Journal Architectural Computing, Volume 4, Number 2, pp 27- 47.

Oh, Yeonjoo, Gabe Johnson, Mark D Gross and Ellen Yi-Luen Do, "The Designosaur and the Furniture Factory," (2006) in Design Computing and Cognition, (ed) John S Gero, Springer, pp. 123-140.

Johnson, Gabe, Mark D Gross, Ellen Yi-Luen Do, "Flow Select: A Time-Based Selection and Operation Technique for Sketching Tools" (2006) , International Conference of Advanced Visual Interfaces (AVI 2006) Venice, Italy.

Other (miscellaneous) information about the project:
related class: Digital Fabrication: http://code.arc.cmu.edu/~mdg/DigiFab07
related class: Architectural Robotics: http://code.arc.cmu.edu/~mdg/ArchiBots07

Mark Gross, PhD

Project Title:
Design Research Summer Workshop

Grantor or Sponsor:
National Science Foundation

Principal Investigator (at CMU):
Mark D Gross

Co-investigators (& affiliations if not CMU-SoA):
Mary Shaw (CMU-SCS), Susan Finger (CMU Civil Engg), Jim Herbsleb (CMU-ISRI)

Budget / award (total over project period, all co-investigators):
$130K

Project start date / Project end date
September 2006; August 2009

Key words:
Science Of Design
Community Building Activities

Project Web site:
http://www.cs.cmu.edu/~sfinger/summerschool/index.html

Abstract:
We propose an annual, week-long summer workshop in which PhD students, who are just beginning to develop their research proposals, will have the opportunity to work closely with faculty and researchers on the forefront of software design research and related design fields in seminars, symposia, and working groups.

Project Summary:
The primary goal of our proposal is to develop an open community of graduate students, faculty, and industry researchers who are actively engaged in the advancement of software engineering design research. A secondary goal is to expand this community to encompass researchers from related areas of design research who can contribute to the software design community and who can take ideas from software design back to their own research communities.
We propose to create an annual, week-long summer workshop in which PhD students, who are just beginning to develop their research proposals, will have the opportunity to work closely with faculty and researchers who are on the forefront of software design research and related design fields. In seminars, symposia, and working groups, the participants in the workshop will:

- read classic design literature;
- study software design research paradigms;
- engage in discussions with researchers from other fields, including for example: engineering design, industrial design, architecture, and cognitive science;
- listen to great designers from software engineering and other fields; and
- propose, discuss, argue and develop their ideas with their fellow students and with the faculty.

The curriculum from the workshops can be replicated at other sites and in differing formats depending on local needs. Every workshop participant leaves with a complete set of materials so that participating faculty, students or industry researchers could run a similar workshop at their home institution. An active, on-line community keeps the participants connected after the workshops are over.

List of key project publications (reports, published papers, etc.):

"Strategies for Research about Design: a multidisciplinary graduate curriculum,"
Gross, Mark D., S.Finger, J.Herbsleb, M.Shaw, Proc. 2nd Intl Conf on Design Science Research in Information Systems & Technology, Claremont CA, May 13-15 2007

Design Research Summer Workshop: Final Report to the National Science Foundation (in preparation)

Volker Hartkopf, PhD
David Archer, PhD, PE

Project Title:
Advanced Building Efficiency Testbed
Intelligent Workplace Energy Supply System, ABET/IWESS

Grantor or Sponsor:
U. S. Department of Energy, Pennsylvania
Department of Environmental Protection, U. S. Department of Defense

Principal Investigator:
David H. Archer

Co-investigators:
Volker Hartkopf

Other Institutional or Corporate Partners:
Milwaukee School of Engineering, Sierra Nevada College, Texas A & M University, University of Maryland, Broad Air Conditioning, LTG, Semco, Siemens Building Technologies, Traco Windows, Somfy, Astorino Engineers, CTI Biofuels, ENTPE of France

Budget:
$3.1 million over three years

Project Start Date / Project End Date:
September 2004; December 2007

Key Words:
energy supply
buildings
solar thermal
bioDiesel
fan coil
desiccant dehumidification
heat pump

Project Web Site: http://cms-staging.andrew.cmu.edu/iwess

Abstract:
IWESS, the Intelligent Workplace Energy Supply System, is an integrated set of components that uses solar thermal energy and a renewable liquid fuel to provide power, cooling, heating, and ventilation for Carnegie Mellon's Intelligent Workplace, the IW, and its occupants. The objective of the IWESS is to provide a healthy, productive, and comfortable environment for the occupants of the IW and to reduce the primary energy requirements for its operation by a factor of two. Graduate students and faculty have been involved in the design, installation, test, and evaluation of the IWESS.

Project Summary:
The IWESS is a distributed generation and a combined cooling, heating, and power, CHP, system; it comprises

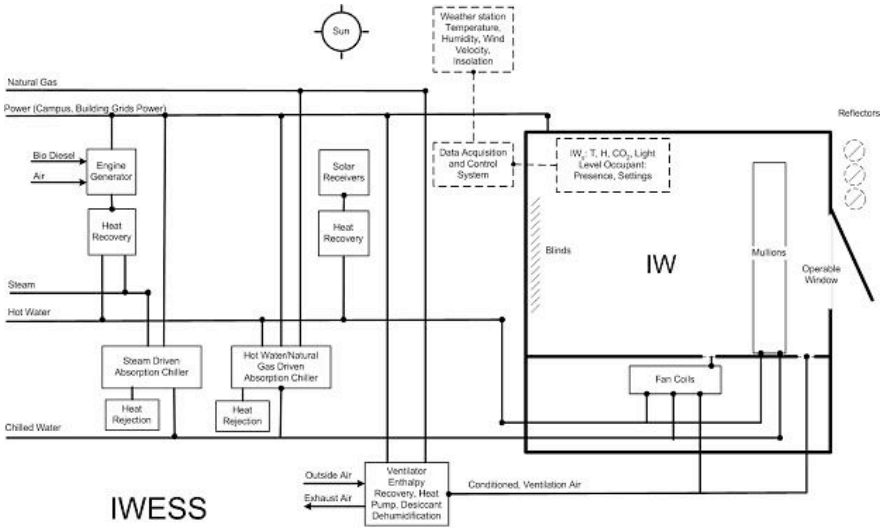
- solar receivers, 52 m^2 of parabolic trough reflectors, focusing on surface treated receiver connected with a 16 kW absorption chiller/heater.
- a 25 kW bioDiesel fueled engine generator with exchangers for heat recovery from the engine coolant and exhaust driving a second 16 kW absorption chiller
- space cooling/heating units: convective fan coils and radiant mullion pipes and ceiling panel units.
- a ventilation unit including enthalpy recovery, air cooling/heating by an air based heat pump, and air dehumidification by a solid sorbent.

The operation and control of these IWESS component system is integrated and integrated also with the IW and with the Carnegie Mellon campus grids for electric power, steam, hot water, and chilled water. These grids serve as a user of excess energy delivered by the IWESS and as an energy back up supply in case of deficiency of IWESS energy for delivery to the IW.

The goal of the IWESS is to provide the various energy forms for the health, productivity, and comfort of IW occupants at an overall efficiency twice that of conventional energy supply arrangements.

The IWESS program has included the work of graduate students and faculty in

- the design, procurement, installation, test, and evaluation of the individual component systems of the overall system.
- the integration of the operation and control of these components with each other and with the IW.
- the performance modeling of the IWESS with the IW and their operation and control system to provide estimates of their annual energy efficiency, the effectiveness in providing appropriate conditions in the IW, and the capital and -annual operating costs of the system.



IWESS System Integrated with the Intelligent Workplace

CMU's Intelligent Workplace atop MMCH; Note the Solar Receivers

BioDiesel Engine Generator with Heat Recovery Equipment, MMCH C9

List of Key Project Publications:
IWESS publications are included in the IWESS website

Solar Thermal System
* Ming Qu, David H. Archer and Hongxi X. Yin, A linear parabolic trough solar collector performance model, Proceedings of Energy Sustainability 2007, June 27-30, 2007, Long Beach, California
* Ming Qu, David H. Archer, Sophie Masson and Hongxi X. Yin, Solar Absorption Cooling and Heating System in the Intelligent Workplace, Proceedings of Energy Sustainability 2007, June 27-30 2007, Long Beach, California
* Sophie V. Masson, Ming Qu, David H. Archer, Performance modeling of a solar driven absorption cooling system for Carnegie Mellon University's Intelligent Workplace, Proceedings of International Conference of Enhanced Building Operation, 2006, Shenzhen, China
* Sophie V. Masson, Ming Qu, David H. Archer, Performance modeling of a solar thermal system for cooling and heating in Carnegie Mellon University's Intelligent Workplace, Proceedings of Energy Sustainability 2007, June 27-30 2007, Long Beach, California

Steam Absorption Chiller
* Hongxi X. Yin, An Absorption Chiller in a Micro BCHP Application: Model based Design and Performance Analysis, Thesis report, Carnegie Mellon University, September 2006 (Appendix 1A, 2A, 2B, 3A, 4A)

Radiant Mullion Cooling/Heating Units
* Xiangyang Gong, Investigation of a Radiantly Heated and Cooled Office with an Integrated Desiccant Ventilation Unit, Thesis Report, Texas A&M University, 2007
* Xiangyang Gong, David E. Claridge, Impact of the Position of the Radiators on Energy Consumption and Thermal Comfort in a Mixed Radiant and Convective Heating System, ASHRAE Transactions, V 113, part 1, 2007
* Xiangyang Gong, David E. Claridge, Indoor Humidity analysis of an Integrated Radiant Cooling and Desiccant Ventilation System, Proceedings of International Conference of Enhanced Building Operation, Nov 6-9, 2006, Shenzhen, China.
* Xiangyang Gong, David E. Claridge, Impact of the Position of the Radiators on Energy Consumption and Thermal Comfort in a Mixed Radiant and Convective Heating System, Proceedings of International Conference of Enhanced Building Operation, Oct 11-13, 2005, Pittsburgh

Ventilation unit
* Chaoqin Zhai, David H. Archer and John C. Fischer, The Performance of an Energy Recovery Wheel in Ventilation of CMU's IW, Proceedings of IMECE2006: ASME International Mechanical Engineering Congress and Exposition, November 5-10, 2006, Chicago

Other Information about the Project:
The IW and the IWESS were featured in a TV broadcast on the Discovery Channel in August 2007

Kristen Kurland

Project Title:
Diabetes Prevention and Treatment Programs for Western Pennsylvania

Grantor or Sponsor:
Department of Defense

Principal Investigator:
Silva Arslanian, M.D., Weight Management and Wellness Center Director, General Clinical Research Center, UPMC Richard L. Day Endowed Chair in Pediatrics, Professor of Pediatrics, University of Pittsburgh School of Medicine

Other institutional or corporate partners:
Carnegie Mellon University, Kristen S. Kurland

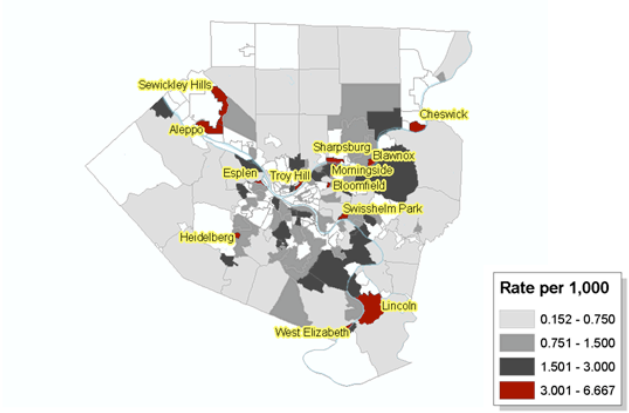
Budget / Award:
$25,000 (Kurland award amount)

Project start date:
January 2007

Key words:
Childhood Obesity
Diabetes
Health and the Built Environment
GIS
Health Mapping

Project Web site:
N/A.

Obesity Prevalence by Municipality and Neighborhood
Allegheny County, PA



Data obtained from CHP, WMWC 3/2007
Map created by Kristen Kurland, Carnegie Mellon University

Project summary:
Geographic Information Systems (GIS) are computer-based applications designed for the storage, retrieval and analysis of geographically referenced data. In other words, GIS can generate maps using a wide array of physical, biological, cultural, demographic and economic information. GIS is used in the health care industry as an effective tool to visualize and analyze multiple layers of information. Most health care experts agree that no single factor is responsible for childhood obesity. Rather, the causes are complex and attributed to many factors. Among these are genetics, socioeconomic issues, excess food consumption and the increasingly sedentary lifestyles of many of today's children. GIS can be a very powerful tool to uniquely analyze the many factors contributing to this epidemic. The following are examples of how GIS can be used in the effort to decrease the epidemic levels of childhood obesity:

Demographics: According to the American Obesity Association, African American, Hispanic American and Native American children and adolescents have particularly high obesity prevalence. GIS can map ethnic, racial, or other census variables such as income and educational attainment to see what neighborhoods and schools might be targets for potential interventions.

Physical Environment: Other information that can be mapped in a Geographic Information System includes locations for physical activities such as parks, bicycle routes, recreational centers, and schools. Urban sprawl is considered a major factor in the lack of physical activity in today's youth. Information about the built environment (buildings, spaces, and products created or modified by people) can be useful to map for analysis of possible physical exercise. For example: buildings (housing, schools, workplaces); land use (industrial or residential); public resources (parks, museums); zoning regulations; transportation systems can determine how these relate to and affect childhood obesity.

Nutritional Information: Nutritional information such as access to food sources including grocery stores, convenience stores, and fast food restaurants can also be mapped. For example, by collecting data on locations of grocery stores, convenience stores, stores selling alcohol, parks, etc., GIS can be used to quantify the proximity and density of such locations to patients in childhood obesity studies. This will permit an assessment of accessibility, as well as exposure to these elements, of the built environment.

Patient and BMI (Body Mass Index) Information: Data collected by researchers at Children's Hospital of Pittsburgh (e.g. patient locations) and school districts BMI information can also be mapped to determine clusters of childhood obesity cases. Again, this data can be overlaid with the above information about demographics, physical environment, and nutrition to determine the spatial relativity of these factors to locations in which childhood obesity is more common. This will aid in identifying what communities or schools need intervention most.

Khee Poh Lam, PhD, RIBA

Project Title:
Integrated Concurrent Design of High Efficiency Commercial Buildings

Grantor or sponsor:
NIST (National Institute of Standards and Technology) ATP Program

Principal Investigator:
Khee Poh Lam

Co-investigators:
Volker Hartkopf

Other institutional or corporate partners:
United Technologies Research Center, East Hartford, CT

Budget / Award:
$430,000

Project start date / Project end date:
March 2005; November 2007

Keywords:
Building Information Systems
Computational Design Support Systems
Energy Simulation
Lighting Simulation
Building Sensing and Controls
Building Investment Decision Support Systems

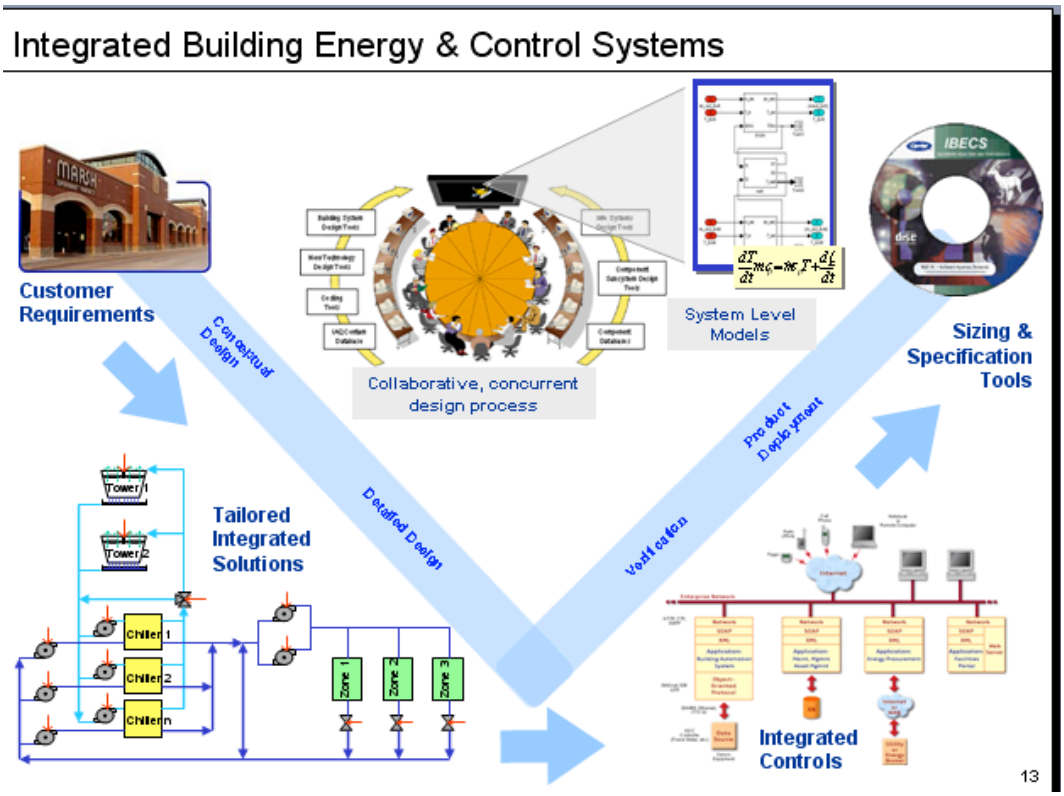
Project Web site:
Managed by UTRC. Access is restricted.

Abstract:
United Technologies Corporation (UTC) entered into a Cooperative Agreement No. 70NANB4H3024 for a project titled "Integrated Concurrent Design of High Efficiency Commercial Buildings" with the National Institute of Standards and Technology of the United States Department of Commerce on May 7, 2004. UTC awarded Carnegie Mellon University, Center for Building Performance and Diagnostics (CBPD), a Technical Services Agreement for the performance of a portion of the work called for in the Cooperative Agreement.

Project Summary:
The CBPD will assist United Technologies Research Center (UTRC with the application of integrated concurrent engineering processes and software to the building design and delivery and mechanical engineering design processes by:

a. providing information and guidance on the state of the art and current trends in architecture and best practices and when necessary provide trade studies on the interrelationship between architectural features and the associated building mechanical system;
b. providing information and guidance on current practice and mechanisms in the building delivery process and identifying the values of key stakeholders in the value chain;
c. creating requirements for improving the building design and delivery process and guiding the software/process development toward the concept of a "virtual charrette;"
d. participating in concept generation activities;
e. providing information and guidance on past projects that are used as case studies in performing the program;
f. as needed host trial charrette workshops based on case studies;
g. participating on the Project Advisory Committee;
h. providing information about the Building as Power Plant activity at the University for its possible future adoption as a case to be considered;
i. providing information about the Building Investment Decision Support (BIDS) and Specifications for High Performance Buildings Projects at University for possible inclusion of their functionality in the software system being developed;

j. providing prototype building models for the building types being considered by the team in the building simlation code that is adopted, such as EnergyPlus, and the calculated loads;
k. attending team meetings at UTRC;
l. attending annual review meeting at NIST;
m. contributing text to monthly and other formal reports required by the Cooperataive Agreement.



List of key project publications:

Post-award Publications:

Dong, B, K P Lam, Y C Huang and G M Dobbs, A comparative study of the IFC and gbXML informational infrastructure for data exchange in computational design support environments. Tenth International IBPSA Conference, edited by Yi J, Zhu YX, Yang X D and Li X T, pp. 1530-1537. Beijing: IBPSA China, 2007. (3-6 September 2007, Beijing, China).

Pre-award Publications (leading to the proposal):

Hartkopf, V., D H Archer and V Loftness, "Building as Power Plant", Chapter 6 in Part 3 — Emerging Technologies and Tools, Smart and Sustainable Built Environment, Eds. Yang, J., Brandon, P. S., and Sidwell A.C., Blackwell Publishing, UK. (2005)

Lam, K P, A Mahdavi, S Gupta, N H Wong, R Brahme and Z Kang, Integrated and distributed computational support for building performance evaluation. Advances in Engineering Software, 33 (2002):199-206.

Lam, K P and Y C Huang, Lighting simulation for architectural design. Paper presented at the Improving Energy Efficiency in Commercial Building (IEECB) Conference 2004, Frankfurt am Main, Germany, 19-22 April 2004.

Loftness, V. and V. Hartkopf, "Building Investment Decision Support (BIDS): Cost-Benefit Tool to Promote High Performance Components, Flexible Infrastructures and Systems Integration for Sustainable Commercial Buildings and Productive Organizations", The Austin Papers, Building Green, Inc. 2002, ISBN 1-929884-10-9.

Vivian Loftness, FAIA, LEED AP
Azizan Aziz, LEED AP

Project Title:
National Environmental Assessment Toolkit (NEAT)

Grantor or sponsor:
U.S General Services Administration

Principal Investigators:
Vivian Loftness, Azizan Aziz

Other institutional or corporate partners:
Center for Built Environment, Berkeley
Public Works and Government Services of Canada
National Institute of Health
Charles Salter & Associates

Budget / Award:
$100,000 - $350,000/ year since 2002

Project start date / Project end date:
2002 - current

Key words:
Post Occupancy Evaluation
Indoor Environment Quality
Occupant Health, Performance and Productivity

Project Web site:
http://neat2006.arc.cmu.edu

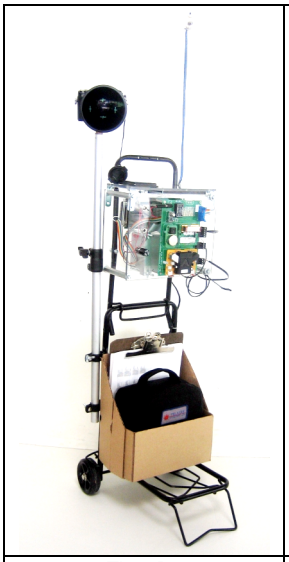
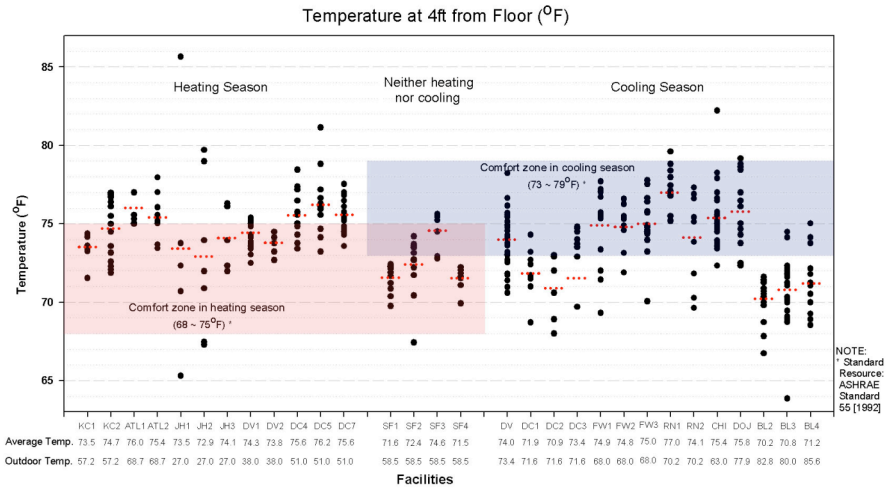
Project Summary:
The National Environment Assessment Toolkit (NEAT) effort has been established to develop the goals and methods for undertaking field research in parallel with innovative workplace design to definitively demonstrate the role of real estate and facilities in individual and organizational effectiveness. The Center for Building Performance is collaborating with a federal research team from U.S. General Services Administration (GSA), Public Works and Government Services of Canada, National Institute of Health and key consultants, in the development of building evaluation protocols linking environmental, technical and spatial quality to individual and organizational effectiveness.

In order to identify the performance/financial data sets of real interest to the federal sector, the team defined five goals:

1. More effective organizational performance
2. Greater collaboration and social integration
3. More effective individual work
4. Greater health of worker
5. More effective resource use - energy and materials

The team developed a framework for productivity research that could be accomplished by a concerted effort in the federal sector to collect before-and-after data on key building attributes, key economic indices linked to productivity and effectiveness, and subjective and objective field measures of environmental quality. The development of consistent field data collection techniques and measures would then support comparisons linking specific goals of GSA WorkPlace20•20 partners, and business measures of success, towards the creation of new case studies that link productivity to the quality of the built environment.

For the NEAT effort, the research team at the Center for Building Performance has developed and is refining an environmental assessment toolkit. The toolkit has been betatested at more than 30 WorkPlace 20.20 project sites in over 13 cities. The complete suite of NEAT toolkit includes the following techniques and tools – Environmental Instrumentation Cart (eBot), Occupant Surveys (EnviroQuest), Technical Attributes of Building Systems Survey (TABS), and a web-based database for data display and query.

	
The eBot	*Result of temperature measurements at various sites*

List of key project publications:

"Indoor Environmental Quality Toolkit: EnviroBot" Conference on Sustainable Building South-East Asia. Kuala Lumpur, Malaysia. November 2007

"Creating a National Environmental Assessment Toolkit (NEAT!) Productivity Protocols for the Field Evaluation of Baseline Environmental Quality" USGBC International Green Building Conference. Pittsburgh, PA. November 2003

Vivian Loftness, FAIA, LEED AP

Project Title:
Building Investment Decision Support Tool (BIDS™): Cost-Benefit Tool to Promote High Performance Components, Flexible Infrastructures and Systems Integration for Sustainable Commercial Buildings and Productive Organizations

Grantor or Sponsor:
Advanced Building Systems Integration Consortium (ABSIC)
Department of Energy, Northwest Energy Efficiency Alliance

Principal Investigator:
Vivian Loftness

Co-investigators:
3-5 PhD students each year, MS students, CBPD faculty

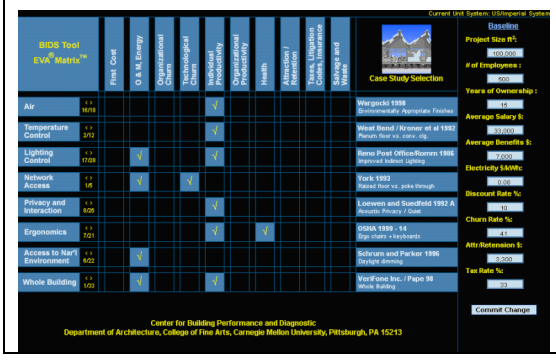
Budget / Award:
$100,000/ year since 2002

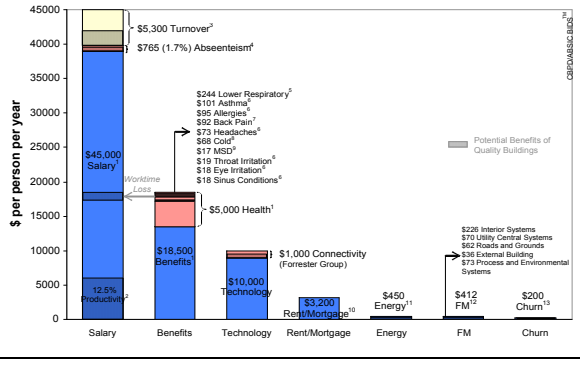
Project start date / Project end date:
January 2002 - ongoing

Key words:
Guidelines for High Performance Buildings
Quantifying Health and Productivity
Case-based Life Cycle Decision-making

Project Web site:
Public web site for energy related health/productivity guidelines: http://cbpd.arc.cmu.edu/ebids/
Full case study data base at http://cbpd.arc.cmu.edu/bids/, restricted to ABSIC members.

Project summary:
BIDS™ is a case-based cost-benefit analysis tool to support investments in advanced and innovative building systems that improve environmental quality, health and productivity in buildings. Through ABSIC support, the CMU project continues to identify laboratory and field case studies demonstrating the relationship of high performance components, flexible infrastructures and systems integration to the range of cost-benefit and productivity indices, with over 300 in the tool by July 2007. The team is also expanding the data base relating quality indoor environments to major capital cost and benefit areas, including productivity, health, and operations costs, with baseline data sets to support life cycle decisionmaking. Through extensive national and international lecturing, and a robust web based tool, the BIDS and e-Bids efforts are leading decisionmakers to incorporate high performance HVAC systems, improved ventilation effectiveness, and task controls (see web sites http://cbpd.arc.cmu.edu/bids (password protected) and http://cbpd.arc.cmu.edu/ebids (public).





List of key project publications:

Building Investment Decision Support (BIDS): Cost-Benefit Tool to Promote High Performance Components, Flexible Infrastructures & Systems Integration for Sustainable Commercial Buildings and Productive Organizations, annual report to ABSIC 2003-present, Loftness et al

Case Studies for the Life Cycle Justification of High Performance, Environmentally Responsive, Green Hospitals; Northwest Energy Efficiency Alliance report, 2006, 150 pages.

"Where Windows Become Doors" Loftness, V and M. Snyder, in Biophilic Design Theory, Science and Practice, Kellert et al editors, John Wiley 2007.

Sustainability and Health are Integral Goals for the Built Environment, Healthy Buildings 2006 Proceedings, Vivian Loftness, FAIA; Volker Hartkopf, PhD; Lam Khee Poh, PhD

Building Investment Decision Support (BIDS): Cost-Benefit Tool to Promote High Performance Components, Flexible Infrastructures and Systems Integration for Sustainable Commercial Buildings and Productive Organization, Loftness, Hartkopf, Gurtekin et al, 2005 AIA Report on University Research

Ramesh Krishnamurti, PhD

Project Title:
Computer-Aided Design for Sustainable Building

Grantor or Sponsor:
Autodesk

Principal Investigator:
Ramesh Krishnamurti

Budget / Award:
$600,000

Project Start Date / Project End Date
January 2007/December 2009

Keywords:
Sustainable Building
Rating Systems
Building Information Models
Performance Evaluation

Project Website:
None

Abstract:
The advent of building information modeling (BIM) has facilitated model change and propagation via parametric object oriented representation. We see a BIM an ideal place to integrate a sustainable building rating system to aid in sustainable building design. The project seeks to assist designers with objective assessments of sustainable design.

Project Summary:
The goal of the project is to develop both, a methodology and tools, to evaluate environmental consequences in design decision-making. The intention is to assist the designer during the design process as well as to respond to sustainable building performance and management needs. The project examines two major entities: i) The different sustainability rating systems through the lens of their inherent categories, criteria, scopes and assessment methods; and ii) A building information model (BIM), that can be used to apply the rating systems to produce feedback to the designer. Depending on the design phase relevant information to evaluate the sustainability rating of a building may be inadequate, thus assumptions based on type, location, climate and form are used as parameters to supply the baseline information. With design development, these assumptions can be replaced with details and specifications from within the model.

To provide an assessment of the buildings performance with respect to some rating system, the requirements vary from i) directly getting information from the model and running calculations ii) adding in external objects and information absent in the model iii) invoking or linking to simulation tools that are not within the model iv) prompting the user for more information to v) providing results and recommendations. The general framework of rating systems encompasses all the objects that the different criteria could be mapped to in a BIM. This approach allows us to create a flexible enough rating system model to facilitate interaction with a BIM during the design process.

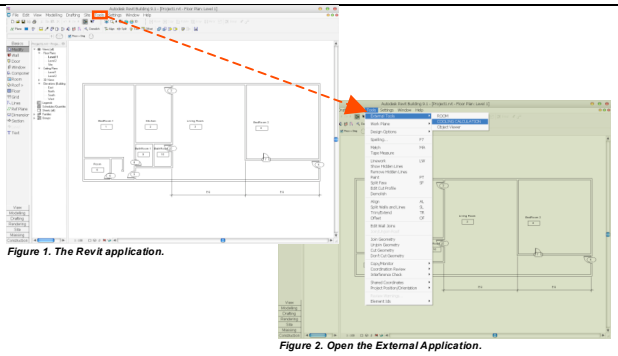
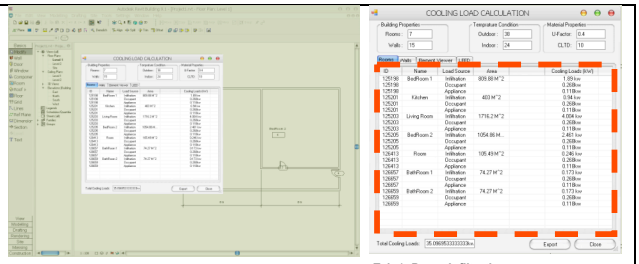


Figure 1. The Revit application.

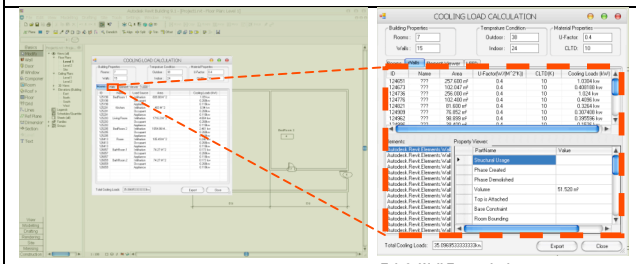
Figure 2. Open the External Application.

Calculating cooling loads from model



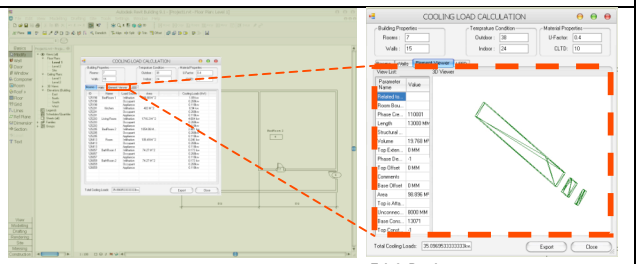
Tab 1. Room Infiltration

Extracting surface areas from wall, floor and ceiling



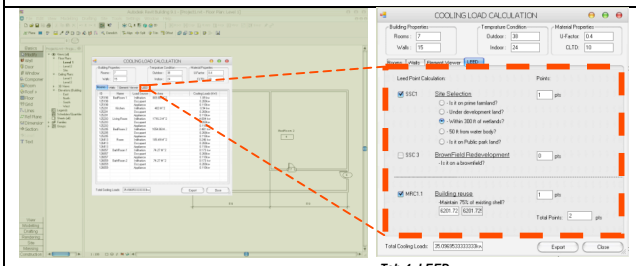
Tab 2. Wall Transmission

Wall transmission loads



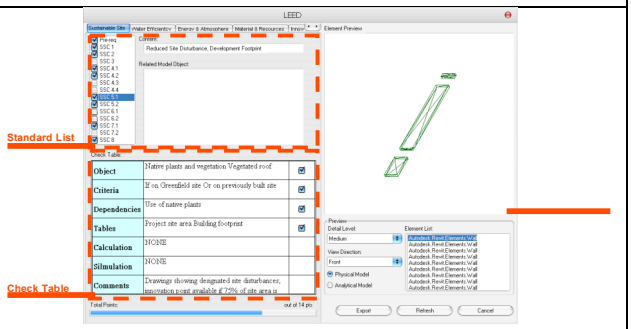
Tab 3. Preview

Preview window with element properties



Tab 4. LEED

LEED evaluation of some criteria



Components of the application

List of Key Project Publications:

Working document

Tajin Biswas, Tsung-hsien Wang and Ramesh Krishnamurti, “Integrating Sustainable Building Rating Systems with Building Information Models.” Submitted to CAADRIA’08

Pre-award

Kuhn Park, Viraj Srivastava, and Ramesh Krishnamurti, “SmartBIM: The Progression of Integrated Building Information Model over the Life-cycle of a Building”, ACADIA2005 [Smart Architecture: Integration of Digital and Building Technologies], Savanah, Georgia, 13-16 Oct 2005

Ramesh Krishnamurti, PhD

Project Title:
PILOT: Predicting Interior Layouts Over building Types

Grantor or Sponsor:
US Army Corp of Engineers Civil Engineering Research Lab (CERL)

Principal Investigator:
Ramesh Krishnamurti

Budget/award:
$109,172

Project Start Date / Project End Date
January 2007/December 2007

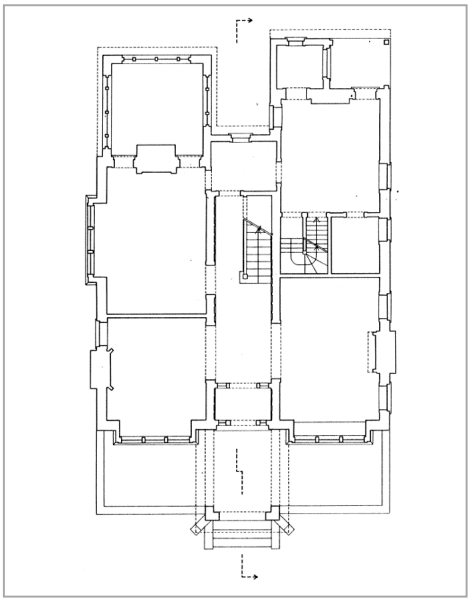
Keywords:
Shape Grammars
Interior Layout Prediction
Rule-based Generation
Constraint Satisfaction

Project Website:
None

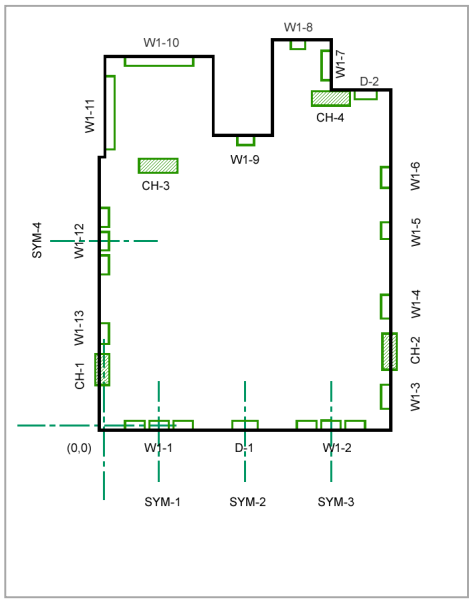
Abstract:
A basic research project to investigate algorithms for the prediction of interior layouts of buildings in a given style with given external features, using shape grammars as the knowledge base.

Project summary:
The objective is to develop a method for rule-based generation of possible layouts for the interior of a building and to implement the method as a prototype for layout generation. The problem is formulated as two major sub-tasks: i) developing the mechanism to convert prior knowledge into sets of shape rules, recorded in a database; and ii) generating possible interior layouts using these rules by additionally inputting known features. The short-term assumption, at a minimum, is the availability of a 2.5D model, presumed derived from image data, augmented with associated external features, which include building footprint plus height, and other obtainable building features, such as number, size, and position of windows, paths, etc. A longer-term goal, that motivates us, and which follows from the project is to automate the system by extracting both the 2.5D model and building features from images of the target building.

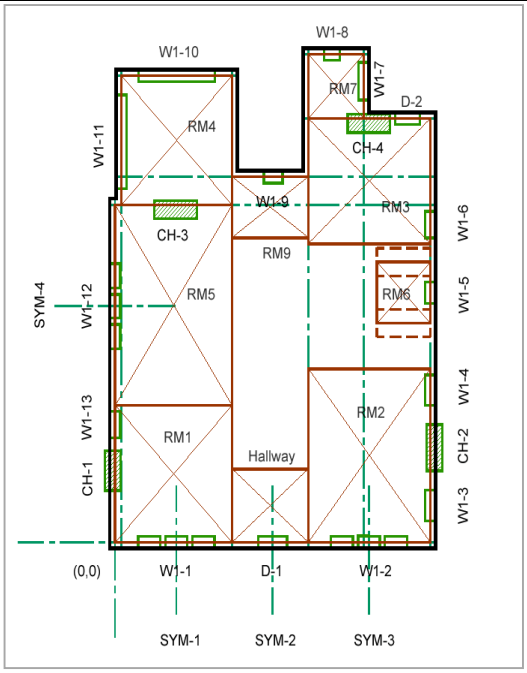
Knowledge used to predict the building interior layout is two-fold: topological, e.g. the relationship between the different rooms in a building, as well as geometrical. A shape grammar considers shapes essentially in topological terms with rudimentary geometry thrown in, with parameterization left to human resolution. To predict the interior layout of real buildings, we consider their topology, measured geometry, and any additional local site/context-related inferences. This approach provides the opportunity, to examine the interaction between topology, exact geometry and context, in turn, to develop a mechanism to transform back and forth amongst these in the context of buildings.



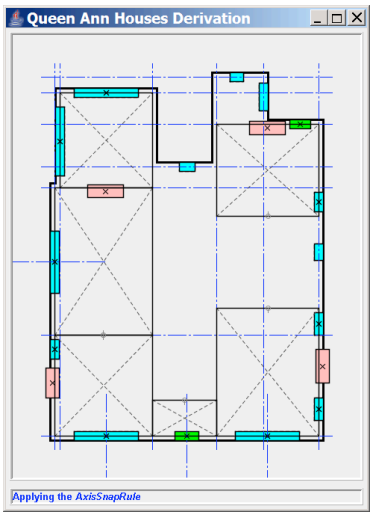
Plan drawing



Input: footprint with features



Deriving a layout by constraint satisfaction



Computer implementation

List of Key Project Publications:
Working documents

Kui Yue, Casey Hickerson and **Error! Contact not defined.**, "Predicting the interior layout of buildings describable by shape grammars" Submitted to CAADRIA'08

Francois Grobler, Ajla Aksamija, Hyunjoo Kim, Ramesh Krishnamurti, Casey Hickerson, and Kui Yue
"Interaction and Exchange between Shape Grammar and Knowledge-Based Model" Journal article in preparation.

Ramesh Krishnamurti, PhD

Project Title:
ITR/IM+AP adsmCon: Early Detection and Management of Defects at Construction Sites Using Integrated Project Models, Laser Scanners and Embedded Sensor Systems

Grantor or Sponsor:
National Science Foundation: Grant No. CMS-0121549

Principal Investigator:
Burcu Akinci

Co-investigators:
Ramesh Krishnamurti, Martial Hebert, Scott Thayer, Mark Patton and Jim Garrett

Budget / Award:
$2,029,598 + REU $20,000

Project Start Date / Project End Date
September 2001/September 2006 (No cost extension till September 2007)

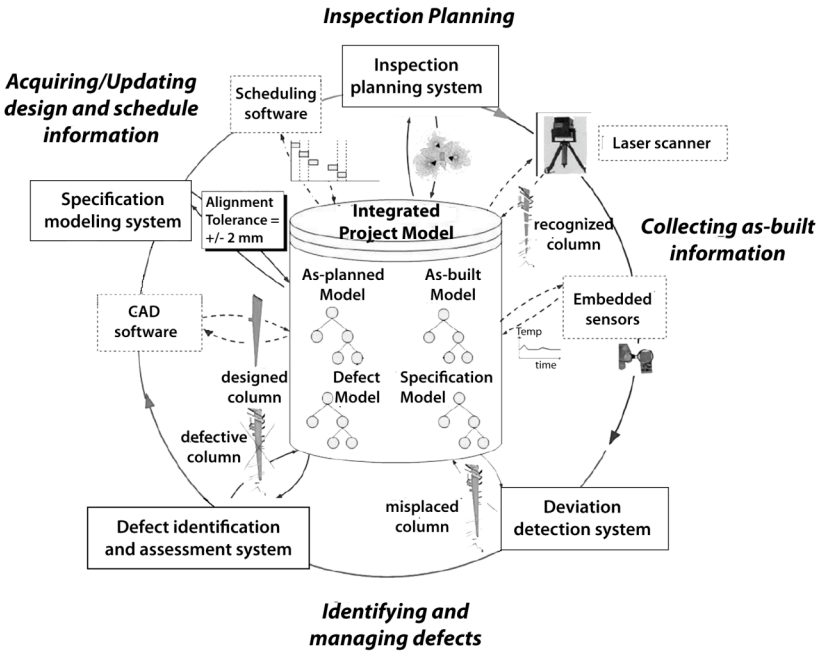
Keywords:
Defect Detection
Construction Sites
Sensor Technology
Embedded Sensing
As-built models
Project Model

Project Website:
http://www.ce.cmu.edu/~ITR/

Abstract:
Frequent and accurate assessment of the status of work-in-place, identifying critical spatio-temporal and qual;ity related deviations, and predicting the impacts of these deviations during a construction project are necessary for active project control and for developing an accurate project history. This project builds upon advances made in developing an automated early defect detection system.

Project Summary:
The ASDMCon project targets detecting defects as they occur, in order to reduce the subsequent rework cost and time. The approach is to perform frequent, complete, and accurate assessments of construction activities by examining the integrated project model (IPM) – a real-time digital model of construction sites. Advanced sensor technologies including range and embedded sensors are key to this model. Range sensors are capable of accurately capturing geometric data, while embedded sensors monitor non-geometric aspects, such as concrete strength and interior temperature.

The IPM comprises the as-planned, as-built, specification, and defect models. The as-planned model reflects the construction schedule, integrating data from the as-designed models and scheduling systems. It consists of a set of time-stamped as-designed components specified by its 3D geometry, identity, and type. An as-planned model at a given time point contains all components of the corresponding as-designed model scheduled to construct before that time. The as-built model contains product and process information based on data collected by range sensors, and the geometry extracted. The specification model is a computer-interpretable version of the construction requirements. Lastly, the defect model contains any product deviations identified by comparing the as-planned and as-built models.



List of Key Project Publications

An incomplete list comprised of papers by Ramesh Krishnamurti or his students. For a more complete list of papers produced in this project visit the project website http://www.ce.cmu.edu/~ITR or Burcu Akinci's website http://www.ce.cmu.edu/~bakinci

Kui Yue and Ramesh Krishnamurti, "Extracting Building Geometry from Range Images of Construction Sites", CAADRIA 07, Nanjing, China, April 18-22, 2007.

Kui Yue, Daniel Huber, Burcu Akinci, Ramesh Krishnamurti. "The ASDMCon project: The challenge of detecting defects on construction sites," Poster Paper, Third International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT'06), June 2006

Rudi Stouffs, Ramesh Krishnamurti and Kuhn Park. "Sortal Structures: Supporting Representational Flexibility for Building Domain Processes," Computer-aided Civil and Infrastructure Engineering, vol 22, 98-116, 2006.

Akinci, B., Boukamp, F., Gordon, C., Huber, D., Lyons, C., Park, K. (2006), "A Formalism for Utilization of Sensor Systems and Integrated Project Models for Active Construction Quality Control." Automation in Construction, Volume 15, Issue 2, March 2006, 124-138

Kuhn Park, Viraj Srivastava, and Ramesh Krishnamurti, "SmartBIM: The Progression of Integrated Building Information Model over the Life-cycle of a Building", ACADIA2005 [Smart Architecture: Integration of Digital and Building Technologies], Savanah, Georgia, 13-16 Oct 2005

Kuhn Park, Ramesh Krishnamurti (2005) "Diary of a Building," Poster Exhibition, CAADfutures2005 [Computer Aided Architecture Design Futures 2005: Learning from the past - A foundation for the future] Vienna, Austria, 20-22 June 2005

Kuhn Park, Ramesh Krishnamurti (2005) "Digital Diary of a Building," in Anand Bhatt (ed), CAADRIA'05, vol 2., pp. 15-25, TVB School of Habitat Studies, New Delhi, India, 28-30 April 2005.

Kuhn Park and Ramesh Krishnamurti. "Flexible Design Representation for Construction" in Hyun Soo Lee and Jin Won Choi (eds) CAADRIA'04, pp. 671-680, Yonsei University Press, Seoul, Korea. 2004.

Rudi Stouffs, Ramesh Krishnamurti and Michael Cummings. 2004. "Mapping design information by manipulating representational structures." in O. Akin, R. Krishnamurti, K-P Lam (eds), Generative CAD Systems, pp. 387-400, Pittsburgh, July 2004

Gordon, C., Boukamp, F., Huber, D., Latimer, E., Park, K., Akinci,, "Combining Reality Capture Technologies for Construction Defect Detection: A Case Study.," EIA9: E-Activities and Intelligent Support in Design and the Built Environment, 9th International Conference, October 2003, Istanbul, Turkey, pg. 99-108.

Rudi Stouffs and Ramesh Krishnamurti. "Representational Flexibility for Design" in J.S. Gero (ed) Artificial Intelligence in Design'02, pp. 105-128, Kluwer Academic, Dordrecht, The Netherlands, 2002

Other (miscellaneous) information about the project:

See the project website http://www.ce.cmu.edu/~ITR or Burcu Akinci's website http://www.ce.cmu.edu/~bakinci

Irving Oppenheim, PhD

Project Title:
MEMS (micro-electro-mechanical systems) Devices for Structural Sensing

Grantor or Sponsor:
National Science Foundation, Pennsylvania Infrastructure Technology Alliance, Transportation Research Board, WavesInSolids

Principal Investigator (at CMU)
Irving J. Oppenheim

Co-investigators:
David W. Greve, Department of Electrical and Computer Engineering

Other institutional or corporate partners:
Lehigh University

Budget / award (total over project period, all co-investigators)
$432,000

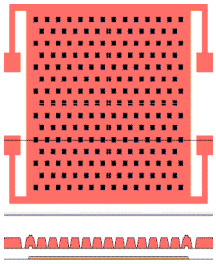
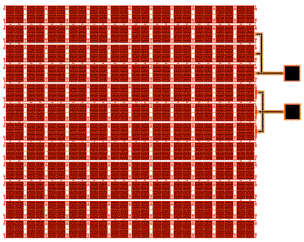
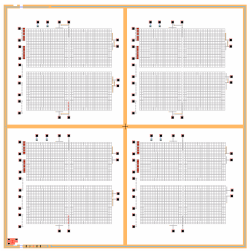
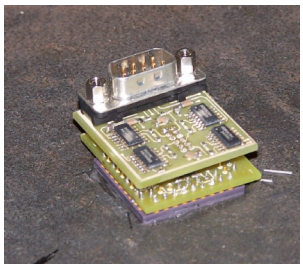
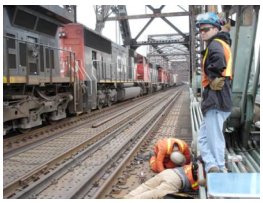
Project start date / Project end date
September 2003; October 2008

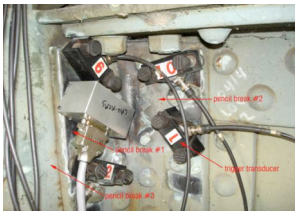
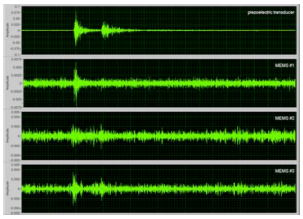
Keywords:
Acoustic emission
Fatigue
Fracture
MEMS
structural health monitoring
ultrasonics

Project Web site:
http://www.ece.cmu.edu/~dwg/research/ae.html

Abstract:
MEMS devices (micro-electro-mechanical systems) are microchips, fabricated like integrated circuits, to create structures at the microscale, less than 1/10,000th of an inch. We use them to build ultrasonic resonators that serve as sensors for acoustic emissions, to detect the progress of fatigue cracking in structures such as bridges.

Project Summary:
Acoustic emissions are stress waves at ultrasonic frequencies that are released when a structural material sustains damage at the microscale. The emissions are indicators of fatigue cracking and flaw growth, and acoustic emission testing is used to identify cracks or flaws before they reach critical sizes that would cause structural collapse. MEMS devices (micro-electro-mechanical systems) are fabricated like integrated circuit chips to create polysilicon structures at the scale of microns (micrometers), less than 1/10,000th of an inch thick and on the order of 1/1,000th of an inch in their long dimension. We use them to build spring-supported plates that act as resonators at ultrasonic frequencies. MEMS fabrication permits the construction of four independent sensors on a single chip, so our system has separate channels at four different frequencies, a multi-frequency capability that is not possible with commercial transducers. Our research into MEMS structures also reveals their interaction with air, which is quite pronounced at the microscale. Our latest MEMS system, containing four separate sensors along with their electronics, is housed in a volume of only 35x35x30 mm. The sensors have been applied in laboratory tests and in field tests for direct comparison to commercial sensors, confirming their capability to detect acoustic emissions. The sensors are currently being adapted by an industry partner, WavesInSolids, for wireless installation on bridge structures.

Top row, left-to-right: MEMS resonator, 125 microns across; sensor array of 144 resonators; four chips, 5x5 mm each, each chip containing four sensor arrays; newly completed system with electronics in a 35x35x30 mm volume

Bottom row, left-to-right: Wiring sensors on the Victoria Bridge, Montreal; Canadian National locomotive; an older version of the MEMS sensor and four commercial sensors; signals comparing commercial sensor to MEMS sensor

List of key project publications:

Ozevin, D., Greve, D. W., Oppenheim, I. J., and Pessiki. S. P., "Resonant capacitive MEMS acoustic emission transducers," Smart Mater. Struct. 15 (2006) 1863-1871.

Wu, W., Greve, D. W., and Oppenheim, I. J., "Characterization and Noise Analysis of Capacitive MEMS Acoustic Emission Transducers," IEEE Sensors Conference, Atlanta, October 2007.

Greve, D. W., Oppenheim, I. J., Wright, A. P., and Wu, W., "Recent Advances in the Mechanics of MEMS Acoustic Emission Sensors," AEWG Conference on Acoustic Emission, Lake Tahoe, October 2007.

Greve, D. W., Oppenheim, I. J., and Wu, W., "Modes and Damping in Cmut Transducers for Acoustic Emission," IEEE Ultrasonics Conference, Vancouver, B.C., October 2006.

Oppenheim, I. J., Greve, D. W., Hay, D.R., Hay, Y. R., Ozevin, D., Pessiki, S. P., and Tyson, N. L., "Structural Tests Using a MEMS Acoustic Emission Transducer," SPIE Smart Structures/NDE Joint Conference, Paper 6174-02, San Diego, February 2006.

Ozevin, D., Pessiki, S. P., Greve, D. W., and Oppenheim, I. J., "A MEMS transducer for detection of acoustic emission events," IEEE Sensors Conference, Los Angeles, November 2005.

Ozevin, D., Pessiki, S., Greve, D., and Oppenheim, I., "Adapting a cMUT transducer to detect acoustic emissions," IEEE Ultrasonics Conference. Rotterdam, October, 2005.

Ozevin, D., Greve. D. W., Oppenheim, I. J., and Pessiki, S. P., "The Characteristics of a New Transducer Design for Acoustic Emission Testing," 6th International Conference on Advances in Civil Engineering, Bogazici University, Istanbul, October 2004.

Ozevin, D., Greve, D. W., Oppenheim, I. J., and Pessiki, S. P., "Resonant Type MEMS Transducers Excited by Two Acoustic Emission Simulation Techniques," SPIE Smart Structures Conference SN09, San Diego, March 2004.

Ozevin, D., Pessiki, S. P., Jain, A., Greve, D. W., and Oppenheim, I. J., "Development of a MEMS Device for Acoustic Emission Testing," SPIE Smart Structures Conference SN09: Smart and NDE for Civil Infrastructure, San Diego, March 2003.

8.0 Centers, Institutes, Labs

The Center for Building Performance and Diagnostics (CBPD)

Carnegie Mellon University

High-performance buildings enhance worker effectiveness and productivity through improved health, communication, and comfort

A National Science Foundation Industry/University Cooperative Research Center since 1992

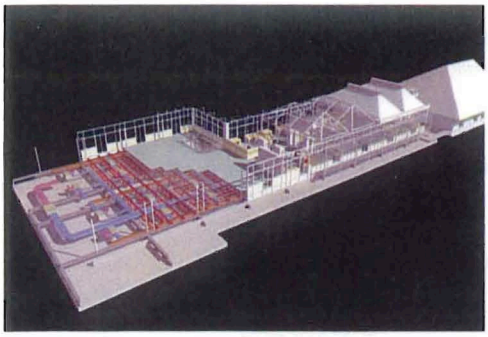
Center Mission and Rationale

The Center for Building Performance and Diagnostics (CBPD) conducts research, development, and demonstrations to increase the quality of and user satisfaction with commercial buildings and integrated building systems, while improving cost, time, and energy-efficiency. High-performance buildings must provide appropriate physical, environmental, and organizational settings to accommodate changing technologies and workplace activities. The Center's members are prominent leaders in the market for high-performance buildings.

The main goals of CBPD are to —

- Study international developments in high-performance buildings. (CBPD has built an international knowledge base on advanced office buildings in Canada, Germany, Japan, the Netherlands, the United Kingdom, the United States, and France.)
- Develop innovative products. (CBPD has developed a list of major design features and decisions that are critical to the advanced office.)
- Develop an innovative building delivery process centered on a team approach to design. (The center has developed guidelines for high performance buildings.)
- Improve educational curricula and materials on systems integration for building performance. (The Center continues to graduate PhD and Masters Students who become leaders in industry, the professions, and industry here and abroad.)
- Designed and constructed the Intelligent Workplace. (The Robert L. Preger™ Intelligent Workplace has won international and national awards, i.e. the Merit Award by the American Institute of Steel Construction [2001]; the Honor Award for Architecture and Design by the AIA [1999]; the Business Week/Architectural Record Award [1999]; the Three Rivers Environment Award in Higher Education [1996].)

The Intelligent Workplace, located on the campus of Carnegie Mellon University, is a demonstration, teaching, and research facility in a high-performance building.



This peel-away view of the Intelligent Workplace illustrates the systems integration of the various building systems and components.

- Complete state-of-the-art demonstration projects. (In 2001, the Center was a key partner in creating the Laboratory for the Design of Cognition at the Electricité de France in Paris.)
- Complete a "breakthrough building" with a private owner or developer. (The Center introduced cost effective high-performance concepts into developer built projects, as well as buildings of State and Federal Agencies.)

The demonstration projects further introduce CBPD findings into the mainstream practices of the building industry.

Research Program

CBPD's investigators have performed significant research in the area of building performance and diagnostics. Selected research activities include —

- Major performance-design decisions for offices, courthouses, and university laboratories
- Energy-efficient revitalization of inner-city housing
- Impact of HVAC, lighting, and enclosure zoning and control on the energy consumption of commercial buildings
- Development of integrated computational design and simulation environments for concurrent performance analysis
- Long-term analysis of the thermal, visual, and acoustical performance of buffer spaces (e.g., atria)
- Studies of daylight/electric light interfaces and development of an expert system to simulate and evaluate the visual quality of indoor rooms
- Empirical assessment and computer simulation of sound

transmission between adjacent spaces
- Development of web-based Guidelines for High Performance Buildings (employed by the U.S. Department of State for the design and engineering of new U.S. Embassies and Consular facilities)
- Development of a web-based interactive Building Investment Decision Support Tool (BIDS) aimed at CFO- and CEO-level decision makers
- The Building as Power Plant/Intelligent Workplace™ Energy Systems, which seeks to integrate advanced energy-efficient building technologies with innovative distributed energy generation systems.

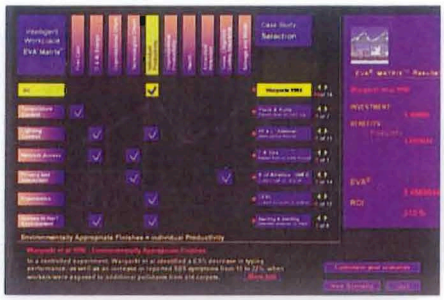
The CBPD research program has several distinguishing characteristics. The Center contends that occupied buildings are the most reliable validation field for the performance of individual components and their impact on occupants (as opposed to the study of one building-performance issue in isolation from others in a "conventional" laboratory setting).

Additionally, CBPD guidelines and practices depart radically from the standard linear process of building delivery and patchwork integration of building systems. The Center advocates a team decision-making process for building design and delivery, starting with an explicit recognition of the performance needs of occupants. This process ensures more fully integrated building design and engineering that provide environmental quality and respond to evolving technologies and the dynamic needs of occupants.

Finally, CBPD research involves an in-depth analysis of interactions and interrelationships between different building-performance descriptors and building systems.

Special Center Activities

In cooperation with the Advanced Building Systems Integration Consortium (ABSIC), which serves as the Center's Industrial Advisory Board, CBPD researchers are carrying out a series of demonstration projects designed to progressively introduce CBPD's research findings into the mainstream building industry. The Robert L. Preger Intelligent Workplace™, first occupied in December 1997, was the first in this series of demonstration projects and satisfies the need for a dedicated research environment that addresses the necessity of integrative building-performance evaluation. This facility not only houses center faculty, staff, and Ph.D. students,



BIDS (Building Investment Decision Support Tool), one of the research projects at the Center, helps decision-makers evaluate the economic significance of building performance on individual and organizational productivity, health, and satisfaction.

along with building performance and diagnostics instrumentation, but also is the subject of building performance research. The facility functions as a dynamic laboratory and a high-performance computing workplace. The Intelligent Workplace™ assimilates experimental design innovations and high-performance products and assemblies into all building systems (enclosure, mechanical, telecommunications, electrical, and interior systems). Since its official opening, several thousand visitors have taken guided tours through the R&D facility.

CBPD research and development activities have fostered several collaborative efforts between sponsor companies to develop improved building products and systems. One example of the Consortium's responsiveness to innovative design directions for industry is the Personal Environments Module™ (or PEM™), which was developed by Johnson Controls Inc. and the CBPD. The PEM™ allows for greater individual environmental control by ducting fresh air to each workstation and permitting the occupant to control air speed, temperature, and direction, along with other environmental factors.

The Center's corporate sponsors include major U.S. construction companies (with worldwide operations) along with manufacturers of instrumentation, controls, telephone and lighting equipment, and software. U.S. Federal government sponsors include the Department of Defense, the Department of Energy, the Environmental Protection Agency, the Department of State, and the General Services Administration. Public Works and Governmental Services Canada has become a member of ABSIC. The Center has several European companies as partners, as well as the Dutch Building Agency.

Other accomplishments of the Center are highlighted below:
- The CBPD offers the only program in the United States with a graduate concentration in building performance and diagnostics.
- The CBPD received an Honor Award for Architecture and Design for the design of the Intelligent Workplace™. This is the highest National Award Category given by the American Institute of Architects, May 1999.
- The CBPD was awarded the Three Rivers Environmental Award in 1996, recognizing its excellence in advancing environmental quality in Western Pennsylvania.

The American Institute of Architecture Students (AIA) named the CBPD faculty member, Vivian Loftness, Head, School of Architecture, "The 2001 National Educator of the Year."

Another project that features Intelligent Workplace technologies and energy conservation measures is the 73,000 sq. ft. Department of Environmental Protection (DEP), Commonwealth of Pennsylvania, Region 3 Headquarters Building.

In close cooperation with the U.S. General Services Administration, the Adaptable Workplace Laboratory, a 15,000-sq.-ft. rehabilitation of one floor of one wing of the GSA Headquarters, was realized using the principles and concepts developed at the center.

The center has contributed key concepts to the Owens Corning Headquarters, Toledo, OH, in cooperation with the office of Cesar Pelli, Architects and Gerald Hines, Developer. Additional projects with Center involvement are ongoing or completed in Seoul, Korea; Germany; France; and North America.

Center Headquarters
Center for Building Performance and Diagnostics (CBPD)
Carnegie Mellon University
Pittsburgh, PA 15213
Tel (412) 268-2350 • Fax (412) 268-6129
Homepage: http://www.arc.cmu.edu/cbpd/

Center Director: Dr. Volker Hartkopf
hartkopf@cmu.edu

Center Evaluator: Dr. Paul Fischbeck
(512) 268-3240

8.1 _ Advanced Building Systems Integration Consortium (ABSIC)

Grantors or Sponsors:
Building industries and government agencies as listed have joined with the Center of Building Performance and Diagnostics at Carnegie Mellon University to advance our goals. Including but not limited to:

AMP/Tyco	Gale Foundation	Osram/Sylvania
American Bridge/Continental Engineering	Grahl Industries, Inc.	PPG Industries
Armstrong World Industries	Hüppe Form	Public Works and Government Services Canada
BP Solar	ICC Technologies	Siemens Energy and Automation, Inc.
BRICSNET FM	Interface, Inc.	Teknion, Inc.
Bank of America	Johnson Controls	United Technologies Corporation
Bayer USA	Josef Gartner & Company	Thermaltech Engineering
Bechtel Corporation	The Knoll Group	Thyssen Krupp
Bell of Pennsylvania	LG-Honeywell Company	US Department of Defense
Bosse Design	LTG Antiengesellschaft	US Department of Energy
CADSPEC Multimedia	LTG Lufttechnische GmbH	US Department of State
Carnegie Mellon University	Mahle GmbH	US Environmental Protection Agency
Consolidated Edison Co. of New York, Inc.	Mori Birou	US General Services Administration
Duquesne Light	National Science Foundation IUCRC	Westinghouse Electric Corporation
Dutch Government Buildings Agency	Northwest Energy Efficiency Alliance	Zumbotel Staff Lighting
Electricite de France	Nucor	

Principle Investigator:
Volker Hartkopf

Budget:
Membership driven with a total from 2000-2007 of $2.45 million. ABSIC fees only. Does not include gifts of equipment
Project Start Date: Spring 1987 Project End Date: On-going

Key Words:
advanced building systems, building integration consortium, building performance, high performance buildings

Project Website: http://www.arc.cmu.edu/cbpd/absic/index.html

Abstract:
Established in 1987, the Advanced Building Systems Integration Consortium (ABSIC) is a university-industry-government partnership to pursue research, demonstration, and development towards improving the quality and performance of commercial buildings and building systems. ABSIC conducts research, development and demonstrations for the purpose of increasing the satisfaction, health, well-being and productivity of occupants, of enabling organizational change, and technological adaptability while improving cost, energy and environmental effectiveness.

Project Summary:

To identify international developments in new office design, organizational approaches, and developments in integrated components and systems. Accomplished through in- depth field studies with a trans-disciplinary team, summarized in executive summaries.

To generate concepts for new products and new integrated assemblies towards the long term performance of advanced buildings. Accomplished through collective efforts of consortium members and CBPD for concept development, and collective research, development and marketing as appropriate.

To improve the process for delivery of high performance Offices of the Future by including building performance quality assurance processes and seeking opportunities to integrate improved processes in on-going projects in the U.S. and abroad.

To develop a highly innovative laboratory with advanced products and advanced product integrations (systems) for educational and research purposes - the Intelligent Workplace of the Center for Building Performance and Diagnostics (with performance monitoring and feedback).

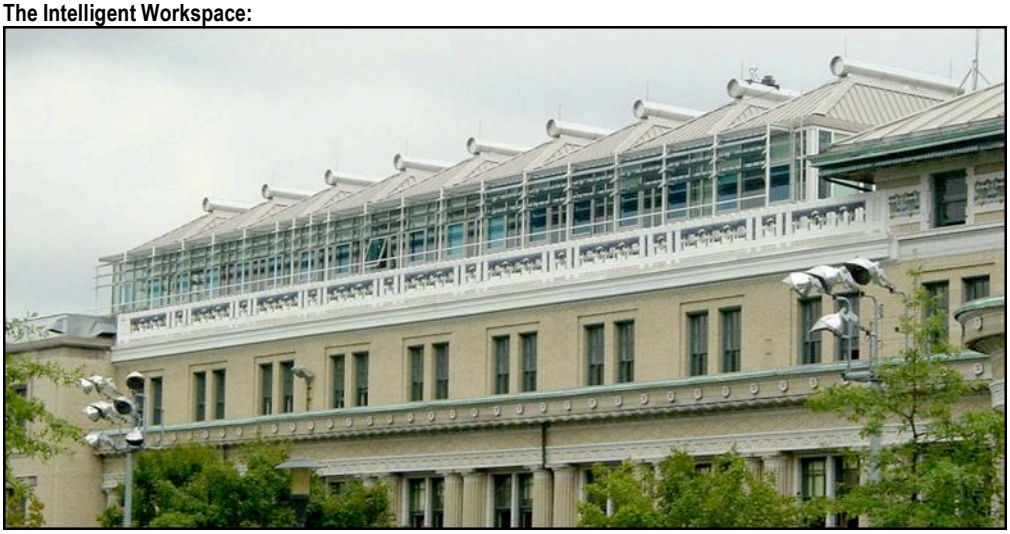
To encourage state of the art demonstration projects with innovative products and product integrations to study the industry's potential penetration into the building delivery process (with performance monitoring and feedback).

To improve graduate and undergraduate educational programs and texts on Systems Integration for Building Performance for professional education programs. To direct MS research & PhD theses that significantly increases the professional knowledge base.

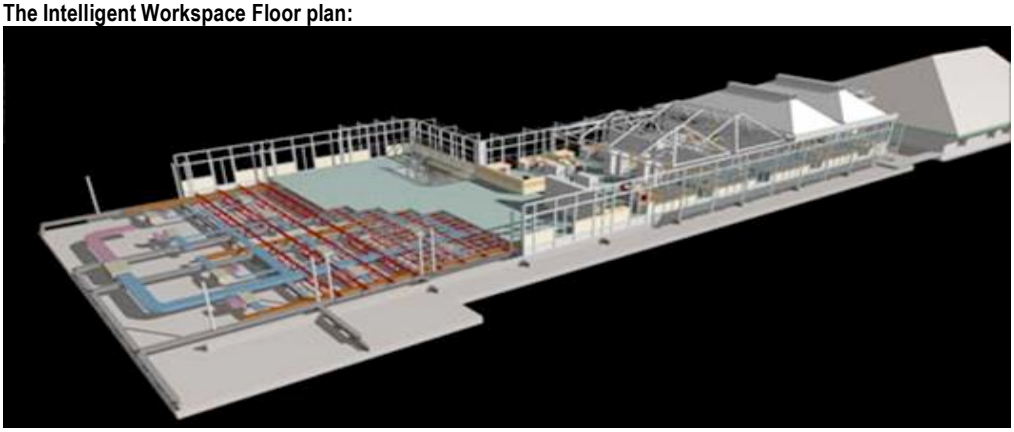
To increase communication and publications on advances in building performance and innovations in product and systems integration for performance.

To develop the Intelligent Workplace Retrofit - re- engineering and re-freshing building shell, core, service and furnishings to support organizational and technological change with high occupant and management benefit.

The Intelligent Workspace:



The Intelligent Workspace Floor plan:



Key Projects:

BIDS™ is a case-based cost-benefit analysis tool to support investments in advanced and innovative building systems that improve environmental quality, health and productivity in buildings. The CMU project through ABSIC support continues to identify laboratory and field case studies demonstrating the relationship of high performance components, flexible infrastructures and systems integration to the range of cost-benefit or productivity indices, with over 300 in the tool by July 2007. The team is also expanding of a data base relating quality indoor environments to major capital cost and benefit areas, including productivity, health, and operations costs, with baseline data sets to support life cycle decision making. Through extensive national and international lecturing, and a robust web based tool, the BIDS and e-Bids efforts are leading decision makers to incorporate high performance HVAC systems, improved ventilation effectiveness, and task controls (see web sites http://cbpd.arc.cmu.edu/bids (password protected) and http://cbpd.arc.cmu.edu/ebids (public).

National Environmental Assessment Toolkit (NEAT)
The development of the National Environmental Assessment Toolkit (NEAT) continues with direct support from the General Services Administration for the before and after field evaluation of over 20 federal facilities nationwide. This toolkit combines portable instrumentation with questionnaires and expert walkthrough to create robust baseline assessments of thermal, visual, acoustic, and air quality in the workplace. The CBPD team has developed robust data collection techniques, GIS based data records, and innovative data analysis tools from scatter plots to environmental "EKGs" for buildings linked to the quality of building systems and facilities use and management. This toolkit and the GSA field studies are central to building the business case for high performance buildings, and linking indoor environmental quality to facility management costs, health, and productivity.

High Performance Building Design Guidelines to ensure that the design/engineering of building systems and systems integration delivers high performance buildings for individual comfort and productivity, organizational flexibility, technological adaptability, and environmental sustainability. These guidelines identify major system innovations for performance and critical system integration issues for early design decision making to educate professionals about high performance building characteristics; illustrate innovation for clients and their design teams to encourage investments in quality; and provide a framework for structuring early design workshops for collaborative, multi-disciplinary design.

Intelligent Workplace Energy Supply System (IWESS) is an integrated set of components that uses solar thermal energy and a renewable liquid fuel to provide power, cooling, heating, and ventilation for Carnegie Mellon's Intelligent Workplace, the IW, and its occupants. Graduate students and faculty in the School of Architecture's Center for Building Performance and Diagnostics have been involved with selecting, installing, testing, and evaluating these components and with integrating their operation both with the IW and with the campus power, steam, and chilled water grids. The objective of the IWESS is to provide a healthy, productive, and comfortable environment for the occupants of the IW and to reduce the primary energy requirements for operating the space by a factor approaching 2. The knowledge gained in this IWESS effort will improve the design of equipment, of systems, and of their operation to reduce the energy consumed by buildings in the U. S., currently 40% of the total consumption of primary energy.

ITEST The Center for Building Performance and Diagnostics (CBPD) has assembled a team of public and private partners to develop the Information Technology Enabled Sustainability Test-bed (ITEST). The goal of ITEST is to integrate "state of the art" IT systems as well as sensing, actuating, and controls technologies to enable effective performance of systems to achieve sustainability in building operations. As a test-bed for ITEST, the internationally renowned green building, the Robert L. Preger Intelligent Workplace (IW) at Carnegie Mellon University, offers an appropriate laboratory for testing systems performance and occupant comfort. Opened in 1997, the multi-million dollar "living laboratory" offers a dynamic and flexible platform for integrating natural conditioning, high performance flexible infrastructures for active conditioning, and advanced energy systems.

Zero Energy Homes Carnegie Mellon has been selected for the third time by the US Department of Energy, to compete in the 2007 Solar Decathlon. Mellon's team is an interdisciplinary mix of students, faculty and staff from the Schools of Architecture, Art, Design, Drama as well as engineering, business and other non-university related groups. Each Solar Decathlon competition is a two-year long process in which competing student teams design, assemble/ disassemble, and operate energy-efficient solar-powered houses while complying with the criteria associated with the 10 contests that comprise the competition. For two weeks in October, a village of solar homes is on exhibit for over 150,000 visitors on the National Mall in Washington DC – providing a showcase where students can demonstrate their ideas and research, as well as interact with public visitors, numerous government and industry representatives along with media representatives from all over the world. Contest rules require that each house generate enough energy to operate a household, a home-based business and related transportation needs. The long-term goal of the Solar Decathlon is to lessen our reliance on fossil fuels, to achieve energy independence and to increase the market share of renewable energy. In order to accomplish this, student teams are challenged to develop strategies and to create designs to make renewable energy costs comparable to that of fossil fuel-generated power by the year 2015. At the same time, the live/ work prototype homes designed by the students must also demonstrate a high quality lifestyle and responds to consumer needs and aspirations.

High Performance Schools - Green Modular Classrooms The distinctions between architecture, industrial design, and manufacturing are beginning to fade, leading to opportunities to create innovative integrated systems that meet emerging sustainability, technological and organizational challenges. Prefabrication and modular buildings are emerging worldwide to address the growing challenges of worker migration, natural disasters, and shortages of construction labor. At the same time, the design of products and product assemblies that can be pre-engineered and rapidly assembled and disassembled offers opportunities for superior aesthetic detailing and performance. Moreover, the design of the integrated systems can contribute to enhanced sustainability through material, energy and water conservation, enhanced environmental quality and even energy generation. In this effort, faculty and students continue to identify, design, develop and mock-up robust, integrated, solutions for modular classroom designs that reflect educational and environmental innovation. Based on precedent studies, the team is developing performance specifications and design variations for components and integrated assemblies in three climates – temperate, hot-humid, and hot-dry. Collaboration for High Performance Schools (CHPS) and LEED for Schools provides a baseline, along with international standards for sustainable schools, towards developing an integrated kit-of-parts with specifications, visualization and mock-ups.

Green, High Performance Hospitals The CBPD has undertaken several projects to develop guidelines and life cycle justifications for the design and engineering of new and retrofit hospitals as well as for the maintenance of existing healthcare facilities. A major publication on Life-cycle Justifications of High Performance, Environmentally-Responsive, Green Hospitals identifies case studies linking the quality of hospital facilities to health or performance outcomes from recovery rates to medication errors. In addition to identifying existing field and laboratory studies, the project continues to establish the baseline energy and economic variables, and the life-cycle return on investment possible through innovative systems and systems integration in healthcare facilities.

Other information about the project:
The IW was featured on The Discovery Channel in August of 2007

8.1 _ BUILDING AS POWER PLANT (BAPP) / MARGARET MORRISON EXTENSION (MMX)

The Building as Power Plant (BAPP) initiative is in the design-engineering phase integrating advanced energy-effective building technologies (ascending strategies) with innovative distributed energy generation systems (cascading strategies), such that most or all of the building's energy needs for heating, cooling, ventilating, and lighting are met on-site. A next generation 'Intelligent Workplace', the built success of the 50,000 square foot BAPP will be its zero carbon/net energy performance as well as user comfort, health and satisfaction, organizational flexibility and technological adaptability as an academic, office and research lab building. Through a series of workshops with leading professionals from around the world, the Center has written design guidelines and developed engineering innovations for BAPP, and successfully written legislation and received research federal funding towards a multi-university National Testbed effort.

The College of Fine Arts, with its constituent Schools of Architecture, Art, Design, Drama and Music has the strategic opportunity to celebrate its 100th anniversary with the announcement to have achieved the necessary funding to create the MMX.

This approximate 60,000 sq.ft. extension of the Margaret Morrison Carnegie Hall (MMCH) completes the Hornbostel Building of 1910 through the addition of a new wing, an atrium and extensive series of large scale workshops. The ASG Master Plan, adopted by the Board of Trustees and City Planning adopts the new addition and gives meaning to a prominent CFA front door - the Margaret Morrison rotunda.

The MMX, generates platforms to strengthen the collaborations between CFA, CS, Engineering, Science, Economics and the Humanities on campus, as well as meeting critical space needs of the college, its students, staff and faculty.

Each of the six floors (exclusive of the area below the atrium) of approximately 8000 sqft, integrates flexible infrastructures with column free interiors (pioneered in the Robert L Preger Intelligent Workplace) to allow for the enactment of unlimited "plays" as on the stage of theaters. This will enable the spatial and functional reconfigurations on demand, without creating delays, waste and construction change costs. This feature alone will generate extensive competitive advantages for the interdisciplinary, research, development and demonstration projects that will flourish as a result of the provided stages.

Furthermore, the MMX is designed, engineered and configured to function as a globally significant proof of buildings that regenerate our environment, by harvesting:

- Sun (passive/active heating/cooling and day-lighting)
- Air (natural and multi-modal natural/mechanical assist)
- Water (rainwater collection, storm water management, and recycling) and
- Soil (green roofs, walls, green houses for food production and air/water)

This is in stark contrast to buildings that continue to take, with globally devastating energy, environmental and health consequences.

The MMX, thereby, houses the world-renown Building as Power Plant project. It is this visionary demonstration effort that could place our university in a position to attract the necessary funds for the project's realization – by pioneering, developing, and demonstrating the technical and economic feasibility, as well as the social, political and environmental desirability, of zero emission, net energy generating buildings. that

Through the concerted efforts of the CBP&D faculty, staff and students, major global players in building, energy and environmental policy and technology are captivated by the opportunities that this project entails and are ready to cooperate; and many are already funding R&D projects of the center and are on the verge of making major funding decisions.

- Industries (Alcoa, Bosch, Broad, Carrier, Conergy, Dauphin, Lindner, PPG, ThyssenKrupp, Siemens, Somfy, Steelcase, etc
- Governmental agencies (PA State: DEP, DE&CD; US: DOD, DOE, Dept. of State, National Security Council, GSA, EPA; Germany: President's Office, Chancellor's Office, Ministry of Economics, Ministry of Building, Transport and Urban Affairs, Embassy Washington DC; China: Ministry of Science and Technology; United Nations Environmental Programme)

CFA and its constituent schools, in partnership with collaborators across the university, must convince the Administration and the Board of the compelling importance of this project, to place it central to the capital campaign, as we strive to manifest our DaVinci Effect. A unique interdisciplinary factory of inventions, this project is more than a building, rocketing:

- the university's strategic directions
- the future of the College of Fine Arts as central to designed invention
- the regional growth of sustainable industries and employment
- invention to meet national energy policy, technology and security
- invention to meet global challenges in energy, environment, and quality of life.

As a design/engineering vision, MMX/Invention Works/BAPP has already achieved global significance. Given the heightened global recognition of our shared environmental, climate and energy challenges, and the need for transatlantic cooperation and partnerships, sponsors in the US, Europe and Asia have expressed interest in supporting Carnegie Mellon, as the most ready among peer institutions.

Bringing together the inventors on campus, the School of Architecture and the College of Fine Arts is proposing a 60,000 sqft wing for Margaret Morrison. A building that generates more energy than it demands of non-renewables, the dynamic classrooms and workshops of this building are critical to CMU's future. While Building as Power Plant is the "platform", the term Invention Works exemplifies the content of the MMX. While my colleagues might object to the analogy, the intention has been to create a next generation Media Lab, a Santa's Workshop for multiple disciplines to "make things" that enhance quality of life and the environment.

Today, there is no one place you can go on Carnegie Mellon's campus to see the visionary work that only collaborations between the Arts, Sciences, and Engineering can invent – the work of MechE/Industrial Design, HCII, ETC, Civil/Art, Music/ECE, Chemistry/Arch...etc. I was a student at MIT in the 1970's when Negroponte, an architect, presented a vision of inter-disciplinarity that in the end transformed MIT's reputation. MIT has a school of architecture and a program in visual arts but no graphic and industrial design, no music, no drama or art school – yet they have convinced the world they are the place to go for interdisciplinary designed inventions. We are so ahead of them in expertise, but have no incubator space to catalyze the inter-disciplinarity or to showcase the results. The Invention Works wing of MM, and the dramatic five story atrium that one enters from the rotunda, would be this destination - addressing exactly the pent-up lab and production needs of disciplines across campus - specifically those dedicated to the making of things that will enhance quality of life and our shared environment.

The lasting impression entering the atrium from the Rotunda or E/W walkway would be of layered workshops, on display on five or even six floors – through glass walls and open balconies and open generous doors, including:

- Wood, metals, plastics shop, manufacturing industrial and architectural products for health and the environment;
- HCII/Robotics project spaces making wearable computers and bio-sensors, controllers to enhance quality of life;
- CIT/CS/ MCS/CFA project spaces on environmental/ health industry products;
- The "HIP" lab - high performance integrated product development.
- Studio for Creative Inquiry/ science and the arts
- CFA/HSS/industry project spaces on next gen work and learning environments;
- Green Chemistry/Green materials project spaces for enhanced quality of life.
- Arch/Eng/Science project spaces on building as power plant, building as fresh water generator (BAPP)
- Urban Lab/RCI/CIT with 3-D immersive regional environments
- The limit is only our expertise and imagination

A second generation Intelligent Workplace for spatial and technological flexibility, the Invention Works would demonstrate next generation flexible infrastructures that enable project rooms to become classrooms to become suites of offices and back to project rooms; all surrounding a showcase atrium teeming with activity and products.

- With balconies as extensions of project rooms, large enough to house meetings of 12 or cars, robots, fuel cells and wearable computers being worked on;
- With screens canted on walls and rails and projectors for 20[1] live interactive projections of the kind of research going on - the 'HIP' lab for high performance integrated product development;
- With generous prefabricated open stairs that encourage climbing, collaboration, and fire safety (with a 50% openable greenhouse roof to make this potentially an outdoor space in fire or good weather);
- Low on the formalism, high on the expression of material, structural joint, design for disassembly, but most importantly people places that cantilever beyond the structures to make people and their projects the focus;
- With an overlay of sunlight and nature to keep the space animated when not occupied and not too tech-y and best of all – sustainable.

8.2 _ CoDe Lab

The CoDe (computational design) Lab started in 2004 is a small research laboratory in the School of Architecture. Directed by Mark D Gross, CoDe Lab students engage in a variety of projects at the intersection of computation and design: architectural robotics, sketch recognition, and computationally assisted design critiquing. The work is supported by grants from the National Science Foundation. Laboratory resources include a Dimension fused deposition modeler (FDM) 3-D printer, a laser cutter, and a small electronics and materials shop that researchers use to develop computationally enhanced physical artifacts. The lab's work has appeared at international conferences, including Design Computing and Cognition (DCC), Creativity and Cognition (C&C), and Advanced Visual Interfaces (AVI), Digital Game and Intelligent Toy Learning (Digitel); and in the International Journal of Architectural Computing, and Leonardo, Journal of the International Society of Arts, Sciences, and Technology.

Current work toward "Computationally Enhanced Construction Kits and Craft" looks forward to the not-so-distant future when computation is integrated into model building and craft activities. The project encompasses a range of explorations: building software to support rapid design and prototyping using computer-aided manufacturing such as laser cutters and 3-D printers, and modeling kits with embedded microelectronics to sense the construction as a designer builds it, and which can provide interactive feedback about the ongoing model.

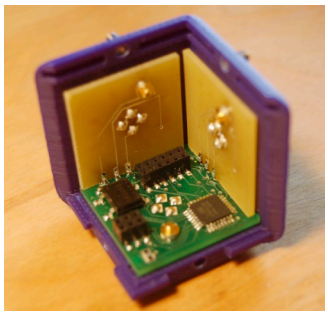
Two projects focus on supporting freehand sketching for the purpose of rapid manufacturing: *Furniture Factory* interprets a designer's isometric drawing as a 3-D model, then helps the designer choose jointing methods for planar parts and finally produces files to output on a laser cutter. *FlatCAD* is a domain-oriented programming language for producing 3-D forms from flat material, linked to the *Olive-2* toolkit for sketch recognition.

Three projects focus on embedded computing: *roBlocks* are the basic modules of a computational construction kit created to scaffold learning of math, science and control theory concepts. By combining sensor, logic and actuator blocks, young kids can create simple reconfigurable robots that exhibit surprisingly complex behavior. In November roBlocks will be featured at the Pittsburgh Science Museum's SciTech Spectacular where middle school students from Western Pennsylvania will play and learn with them.

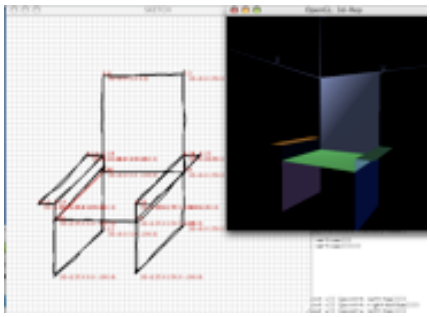
The *cube robots* project (collaborating with Seth Goldstein's Claytronics group in the Computer Science Department) is designing modular robot building blocks that can dynamically reconfigure themselves to different requirements—ArchiGram for real. The project involves the mechanical, electronic, and software design for the robot blocks.

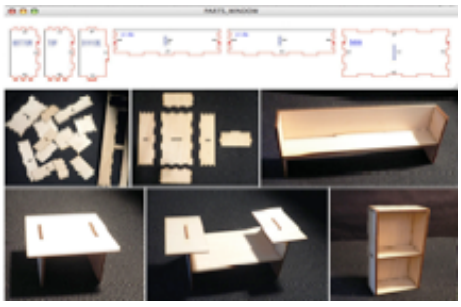
Posey is a computationally enhanced poseable hub and strut construction kit. Its hub and strut form maps to model anything that can be described in a graph structure, for example an articulated skeleton, a chemical molecule, a kinematic linkage or a building structure. Hubs and struts are optocoupled in the ball and socket joints using infrared LEDs and phototransistors. Wireless transmitters in the hubs send connection and geometry information to a host computer. The host computer assembles a representation of the physical model as the user creates and configures it. This representation can then be used by application programs to control models in particular domains.

roBlocks (left: a roBlot; right: electronics computation and communication.

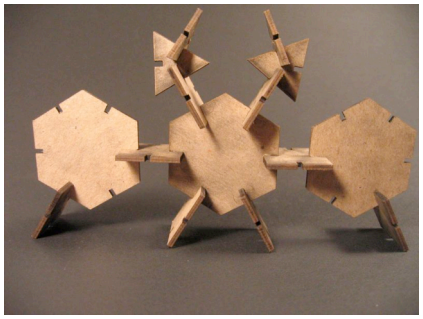


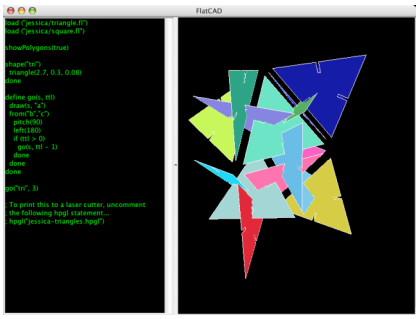
Furniture Factory: (left: sketch recognition; right: parts, joints, and manufacture)



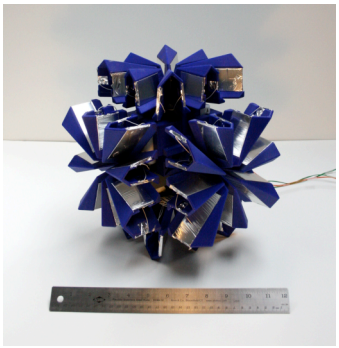


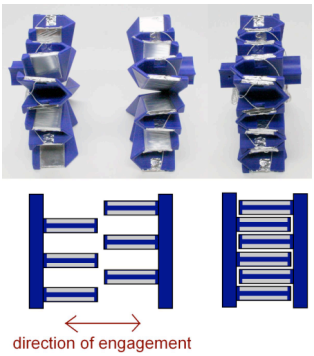
FlatCAD:L (left: a modeling kit produced with FlatCAD; right: screen capture of FlatCAD code)



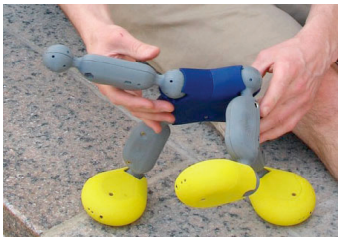


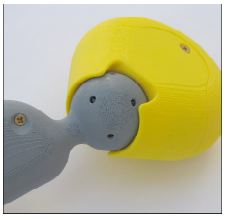
Cube robots: (left: a cube robot with faces retracted; right: faces mate, mesh, and attach)





Posey: (left, a simple Posey model; right: opto-coupled ball-and-socket joint).





8.3 _ The Digital Fabrication Lab

Technological Tools for a Changing Profession
Changing technology has historically played a pivotal role in the practice of architecture and related academic discourse. Advances in materials, systems, and manufacturing have reshaped our built landscape and reconfigured processes of design and construction. Contemporary design and construction processes have been heavily influenced by the systems of mass production developed at the end of the 19th century. While most buildings are singular, specific constructions, many facets of their composition are assembled with universal components. As a result, an architect's ability to deviate from these norms has often been precluded due to issues of time and cost.

Today, this is changing rapidly, as digital media are transforming the practice of architecture and its allied disciplines. While computing as a design tool has been in use for more than forty years and has been applied in production processes in the aerospace and automotive industries, only now has its presence permeated further into the practice of architecture. Boundaries between architect, consultant, and fabricator are shifting, and new approaches to building are emerging with the digital building model as the instrument of communication throughout the process, from "file to factory." Ironically, the pervasiveness of the digital has ushered in a level of control over the physical structure absent for much of the past century. This new control is changing the way architects think about their tasks: as we enter an era in which computing power and manufacturing sophistication allow us to design and construct nearly anything conceivable, architects—and schools of architecture--must increasingly ask "why?" and "to what end?".

The Carnegie Mellon School of Architecture's Fabrication Lab will provide a venue through which students and faculty can gain experience with this new reality of the profession. It will be a vehicle for the use of advanced digitally driven design, prototyping and manufacturing equipment, fostering a context through which students and faculty are better equipped to probe the potential of pervasive digital design and manufacturing processes. Fundamental to this is the understanding that architecture exists in the physical world and the belief that the physical realm of design investigation is a necessary complement to virtual simulation. As such, the Fabrication Lab is a bridge between the digital and the physical and is intended to be utilized throughout the design process at multiple scales. Furthermore, the Fabrication Lab will equip young professionals with the skills to thrive in an increasingly fluid and technologically sophisticated model of practice. This facility is a natural fit in a school of architecture with a strong legacy of innovation in design education and at a university renowned for the advancement and application of technology.

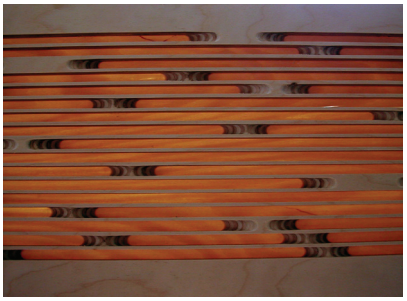
The Fabrication Lab consists of prototyping and manufacturing equipment that allows for two and three-dimensional additive, subtractive and deformation processes. Additionally, high-end computer-aided manufacturing workstations provide access to advanced software related to various design and fabrication processes.

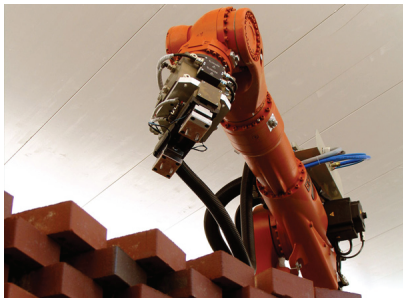
Strategic Partnerships
As the architecture, engineering and construction industries continue to evolve in response to opportunities and demands ushered with the broadened use of digital and integrated practices, the validity of existing processes of design as they relate to the selection and fabrication of building components is increasingly suspect. Existing models of practice in which the design of building components primarily fell under the auspices of the component fabricator resulted in a standardized palate of 'elements' for architects to draw upon. The trade-off for limiting the architect's liability through fabrication testing and assurance has historically been constrained design control. While this practice is in a state of transition, significant hurdles related to design authorship, liability and knowledge bases to mention but a few, remain. If architects are to seize the opportunities associated with integrated practices and project the 'hand' of the designer further into the process of construction, a means to openly share information and knowledge as it relates to design and fabrication is imperative.

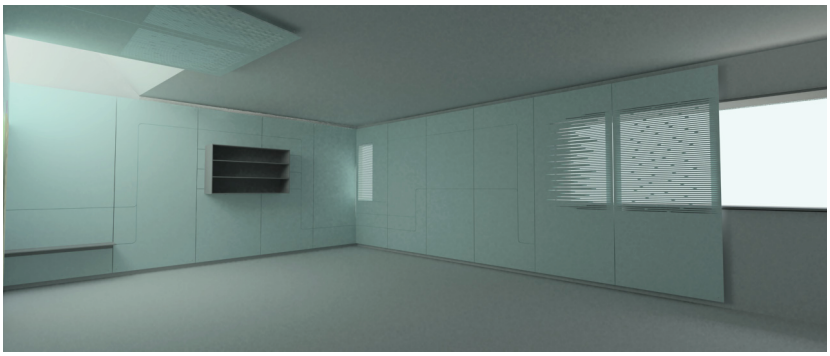
As the digital building model increasingly contains information related to the building process, the virtual building realm and its associated software provide an opportunity for architect centric links between design and fabrication. In seeking to strategically partner with Autodesk, Carnegie Mellon aims to leverage the newly founded Digital Fabrication Lab (DFab) as the means to explore emerging modes of design that are in direct connection with virtual and physical prototyping and fabrication. The current and often disparate array of formats, conventions and interfaces proves problematic as architects increasingly seek to collaborate deeper into the fabrication process. The instruments to engage and share knowledge related to this process are increasingly virtual. Partnership provides the means to explore the design – prototyping – fabricating loop as it relates to the utilization of software.

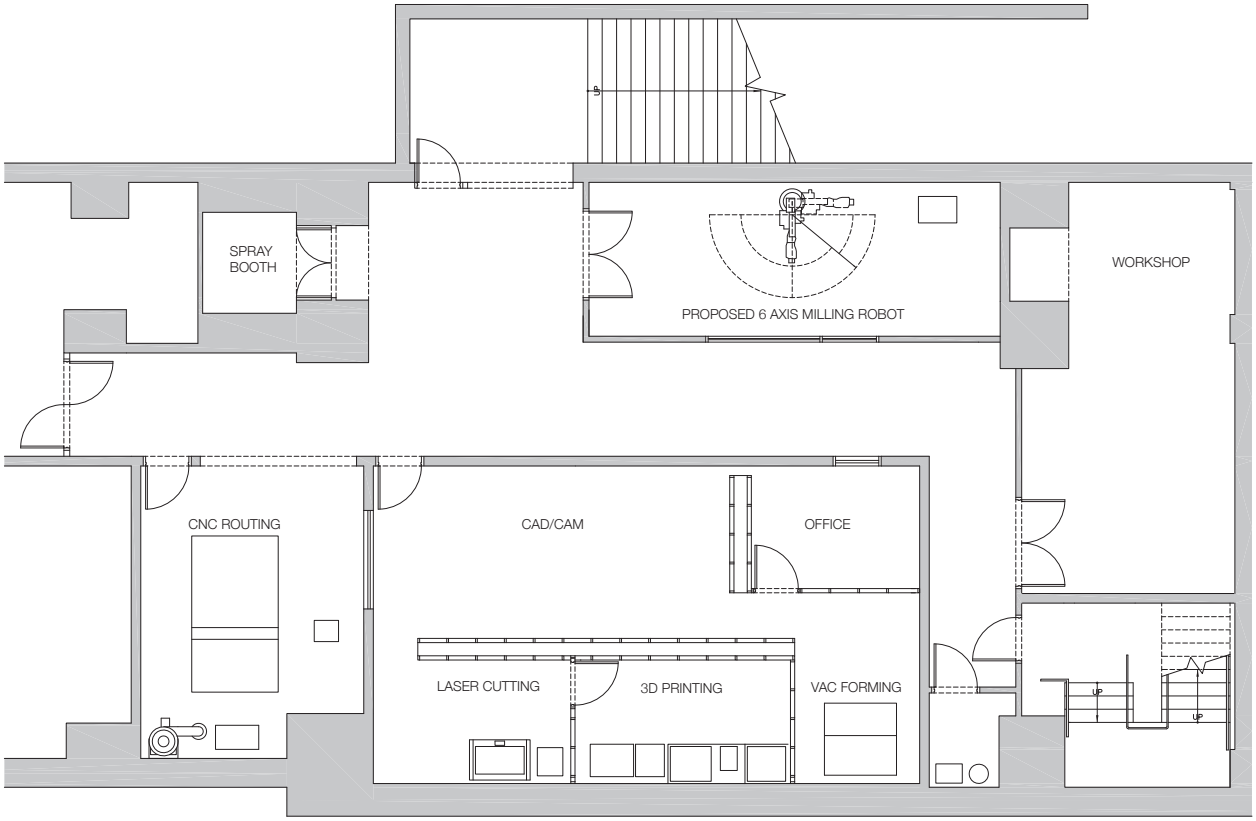
While the DFab is well equipped with various high end tools, our ambition through the acquisition of a 6-axis robot is twofold; (1) provide a means to address the fabrication of complex geometries outside the realm of 3-axis machining through milling of woods, composites and nonferrous metals, (2) broaden the realm of exploration to include digital assembly through numerically controlled assembly of small scale building components. The digital fabrication lab and robot directly impact the work of undergraduate and graduate students through integration to design studios, seminars and workshops, furthermore, the lab can act as a resource for practice driven research related to topics of digital prototyping and fabrication.

8.3 _ Digital Fabrication Lab and Equipment









8.4 _ The Remaking Cities Institute (RCI)

The Remaking Cities Institute (RCI) is a resource for the Pittsburgh region, created to promote an improved quality of life through place-making and carefully planned economic and community redevelopment.

The ability to capture and evaluate the conditions of neighborhoods and regions as well as their ability to deliver the basic tenets of a shared quality of life, and to envision futures that regenerate neighborhoods and regions, is a primary goal of the Remaking Cities Institute at Carnegie Mellon's School of Architecture.

The mission of the Remaking Cities Institute is to catalyze sustainable urban futures and excellence in community design. Our vision is to be recognized internationally as the key resource for rebuilding urban communities, demonstrated through the revitalization of communities in the Pittsburgh region.

Ensuring sustainability and quality of life through urban and regional design requires both multidisciplinary expertise and exposure to participatory processes. Physical decisions about land-use, zoning, transportation and other infrastructures, mixed-use development, and neighborhood design are brought together with urban geography, economics, and policy at the core of the Institute. The centerpiece is a group of students and faculty from different disciplines working with neighborhoods, and political and economic decision-makers, to address the complex and multidimensional nature of sustainable cities and regions.

The RCI benefits from the strengths of the Center for Economic Development (CED), part of Carnegie Mellon's H. John Heinz III School of Public Policy and Management. The seamless integration of their expertise in the work of RCI allows us to leverage academic resources to better understand key regional economic development issues.

The RCI intends to expand efforts to develop visions leveraging the leadership position of the Pittsburgh region in research and development, and linking them to physical planning and ultimately to economic vibrancy and equity, environmental quality, health, safety and overall quality of life.

RCI Partners * Center for Economic Development (CED), H. John Heinz III School of Public Policy

RCI Advisory Board:

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Remaking Hazelwood

The Remaking Cities Institute (RCI) was founded by the Heinz Endowments to convene, host and facilitate the interaction of a select group of technology visionaries to think about the future of the Pittsburgh region, and to put at their service our expertise in urban design and community development. Our work begins in the Greater Hazelwood Area, home to one of Pittsburgh's last remaining large riverfront brownfield sites.

The Wall Street Journal published an article in 1999 calling Pittsburgh "Roboburgh" in recognition of the local concentration of talent in robotics. Can this city that historically has been known as "Iron City" become associated with the incorporation of innovative technologies in our social, cultural, economical, fiscal and natural environments?

What if Pittsburgh becomes a worldwide reference again for something as central to our perception of "modernity" as steel has been for the last century? What if cutting edge technologies are embedded into the daily lives of our communities now? What if robotics spin-off companies settle in the region? What if through technology we can extend the productive participation of aging and disabled populations in the everyday life of our communities; and what if that becomes a major industry? What if the same happens with entertainment technology? What if major international companies are successfully attracted to open manufacturing and/or R&D activities in proximity to the before-mentioned activities? What if 1,000 students move into the Hazelwood area? What services will grow around them? What if Junction Hollow becomes a transit corridor? What if we develop programs for current residents to take advantage of the growing employment opportunities in some of those sectors? What if all this is done with a strong sense of respect for the ecological framework of the region and with a commitment to diversify the economic and cultural opportunities product of the intervention?

These ideas only scratch the surface of the possibilities that could be created by aligning the creative energy of our universities, the motivation for new product development of firms, the principles of sustainable community design and the energy and leadership of our region.

8.5 _ Sustainable Design Academy | Educational Context

The Sustainable Design Academy advances the beneficial relationships between humans and our environment by creating learning opportunities that unite academic research and expertise with the field experience of practitioners.

A Global View
Our relationship with our environment and its resources is rapidly changing. Rapid growth in the developing world, climate change and energy availability have galvanized individuals, organizations and governments to commit to more sustainable practices that could yield potential benefits such as improved national security, new economic opportunities, and better quality buildings and landscapes.

Sustainable development has been gaining mainstream acceptance by the design and construction industries, as well as public policy advocates. One of the unique aspects of the emerging emphasis on sustainable design is its broad penetration across industry segments and the great potential for integration of these ideas into traditional practice. Once seen as a fringe concern, many of these ideas are becoming standard practice. Consider the following:

- The US Green Building Council estimates that since its inception seven years ago, Leadership in Energy and Environmental Design Rating system has over 867 million square foot of commercial building space registered or certified in 50 states and 12 countries—an extraordinary figure in the slow-to-change building industry.
- The American Institute of Architects and other major professional organizations recognize excellence in sustainable design with awards and other recognition programs such as the Committee on the Environment's Top Ten Projects. The AIA's 2030 Challenge is calling for a fifty percent reduction in fossil fuels used to construct and operate new and renovated buildings.
- Continuing education in this area is booming with over 44,000 attendees at USGBC workshops and over 10,000 attendees at the 2007 AIA National Convention titled "Growing Beyond Green."
- Forty-four percent of landholding agencies in the federal government are participating or have achieved LEED registered projects, including the US Navy, the Social Security Administration and the General Services Administration. Many state and local governments have adopted LEED as the building standard for environmental construction.
- Most major cities boast high profile design projects that are also green buildings such as the Greater London Authority Building and Pittsburgh's David Lawrence Convention Center.

As building industries adopt sustainable design ideas as part of common practice, there is a strong need for professional education to develop competencies, build awareness of systems, integrate the efforts of different disciplines and create networks among practitioners. Professionals who are leading the way in the sustainable design efforts bring unique skills and experiences to the classroom and have specific needs from a continuing education experience. Currently the national and regional efforts to provide educational opportunities are scattered, but none comprehensively address the myriad of fields involved in sustainable design.

The School of Architecture (SOA) at Carnegie Mellon University is developing the Sustainable Design Academy, a program to meet the needs of practicing professionals. Based on the SoA's Master of Science in Sustainable Design, the Sustainable Design Academy provides important content for professionals in the various design and construction fields. The program helps transform individuals, practices and the industry by making available world-renowned sustainable design knowledge of the School of Architecture. In return, the program is constantly enriched by professionals who bring experience from the "front line" and inform future research, direction, and mission.

The University Perspective: The Carnegie Mellon Experience
Carnegie Mellon University has adopted a cross-disciplinary approach to environmental work in the university and has integrated the science and technology, design, economic and social sciences. Since 1998, when the university declared "Research and Education on the Environment" as one of four strategic thrusts for the university, a number of initiatives in research, environmental practices and educations have enabled the university to position itself at the cutting edge of environmental practices. Both globally and locally, Carnegie Mellon is continually transforming environments and organizations through environmental research, environmental education, and green practices.

Research. Carnegie Mellon's departments are nationally and internationally know for their research into air and water quality, energy consumption, life cycle assessment, environmental systems modeling and risk analysis. Research is supported through external funding from organizations like the National Science Foundation and the Luce Foundation as well as internal sources like the Steinbrenner Institute. Interdisciplinary collaboration such as those within the Green Design Institute, create major

research efforts that meet environmental and economic challenges across design, management, manufacturing and regulatory processes. The Green Design Institute, like others across campus, partners with companies, government agencies, foundations and other research organizations to discover solutions to problems associated with hazardous waste and toxic materials, and other timely issues.

Education. Environmental education is the core of the University's sustainable design activities at the undergraduate and graduate levels. Our Schools of Engineering, Architecture, and Public Policy train specialists to address issues like materials science, brownfield redevelopment, green buildings, and community development. In addition to these focus areas of study, interdisciplinary inquiry extends through all departments and curriculum with projects like the Provost's initiative," The Greening of the Undergraduate Curriculum." Together with the Steinbrenner Initiative for "Environment Across the Curriculum," the Greening program is an effort to develop the environmental literacy of all undergraduates emphasizing interdisciplinary synthesis and problem solving of complex issues as they are integrated into regular coursework. A Carnegie Mellon graduate should be well poised to understand environmental issues and make positive decisions, as evidenced by the active recruitment of our students with environmental expertise.

Practices. Carnegie Mellon actively explores environmental issues by implementing green practices on campus. One of the major stakeholders, the Green Practices Committee, has identified strategic areas of Campus Life, Facility Infrastructure and Transportation as ways to transform the campus environmental quality. The Committee has supported a number of campus projects and policies such as the construction of a green roof, the implementation of the LEED Building Rating System for campus construction, and the purchasing of green power. The Committee is robust and consists of representatives from departments across campus, including faculty, staff, and facilities personnel.

The School of Architecture and Green Design

The School of Architecture has identified sustainable design as central to its mission. The School is an international leader in environmental design and has lead many campus efforts for sustainability. The Center for Building Performance and Diagnostics (CBPD) is at the core of sustainable research and teaching efforts and engages faculty with diverse areas of expertise, including but not limited to building physics, computer modeling, human factors and professional practice. The CBPD is the first center dedicated to the built environment to be funded by the National Science Foundation.

The Center for Building Performance and Diagnostics is housed in the Intelligent Workplace, a "living laboratory" of innovative systems that allows faculty, students, and visitor's first-hand experience with state-of-the-art technologies. The IW is a demonstration project that integrates day lighting, natural ventilation, solar technologies, user control, easily reconfigurable electrical and communications systems and environmentally sustainable materials within historic campus architecture. Through systems integration, the IW demonstrates an improved quality of life, reduced energy consumption and decreased environmental impact.

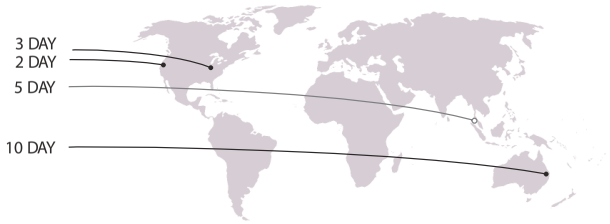
Research funding in the Center for Building Performance and Design exceeds $1 million dollars annually and graduate research includes areas of environmental sustainability, simulation tools, design guidelines, and decision support tools. Collaborations within the CBPD include the Advanced Building Systems Integration Consortium (ABSIC), a university-industry-government partnership pursuing research, demonstration and development towards the improvement of commercial building and systems. ABSIC consists of over 20 national and international organizations and sponsors research projects such as:

Building Investment Decision Support (BIDS) – BIDS is a tool to assist companies in their investment strategies as they construct or renovate their facilities. BIDS helps distill relevant data and research in a way that addresses the priorities and needs of commercial organizations in their struggle to balance the environment and the bottom line.

Building As Power Plant (BAPP) – BAPP will be the next generation of the Intelligent Workplace, a six-story addition that will contain classrooms, laboratories and offices for the College of Fine Arts. The BAPP will feature integration of energy efficient technologies and distributed energy systems to allow for most or all of the heating, cooling, ventilating and lighting needs to be met on site with maximum use of renewable technologies.

The undergraduate curriculum is also committed to the principles of sustainable design. Over 30% of the school's tenured faculty and many of its adjunct faculty have identified sustainable design as central to their research or practice. The curriculum has a strong stream of coursework that address core issues, such as: Materials and Assembly, Architecture and Landscape, Climate and Energy, Acoustics and Light, Mechanical Systems, Zero Energy House, LEED/Green Building Design and History of Sustainable Architecture.

8.5 _ Sustainable Design Academy (SDA)



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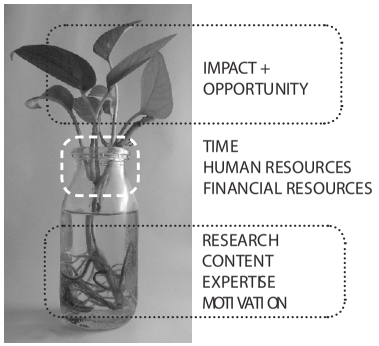

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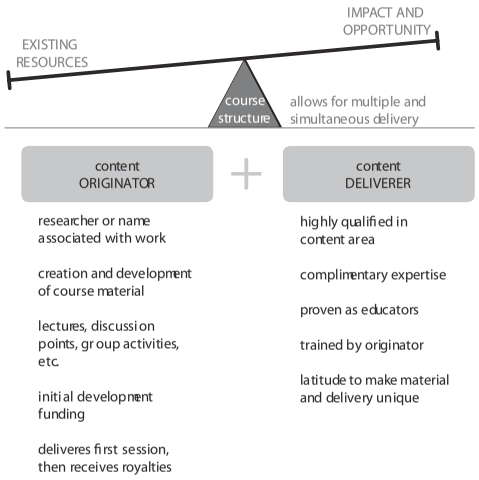

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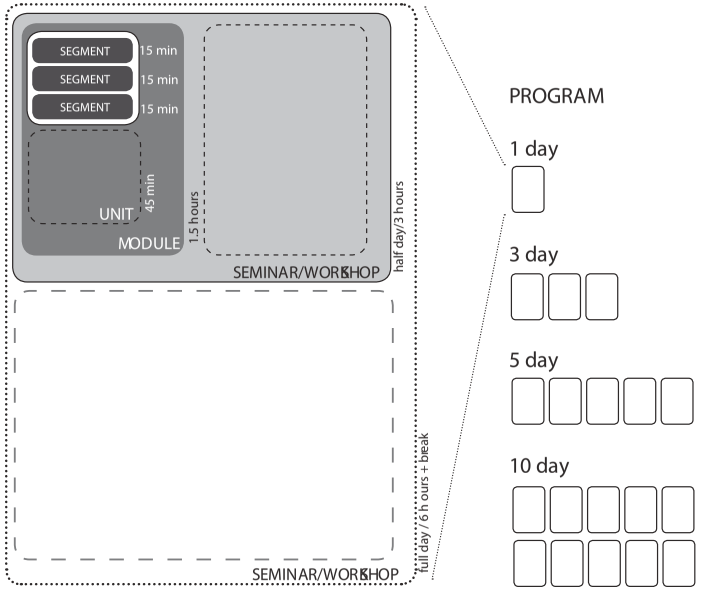

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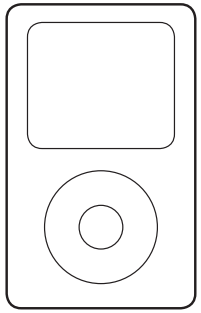
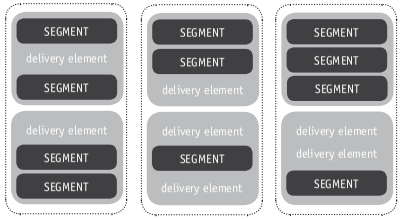
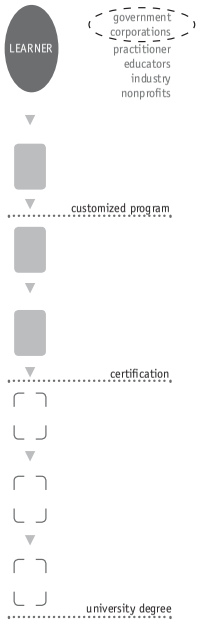


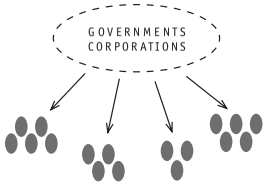


CUSTOMIZATION + LEVERAGE RESOURCES + **BRANDING** + DEFINITION + MULTIPLES

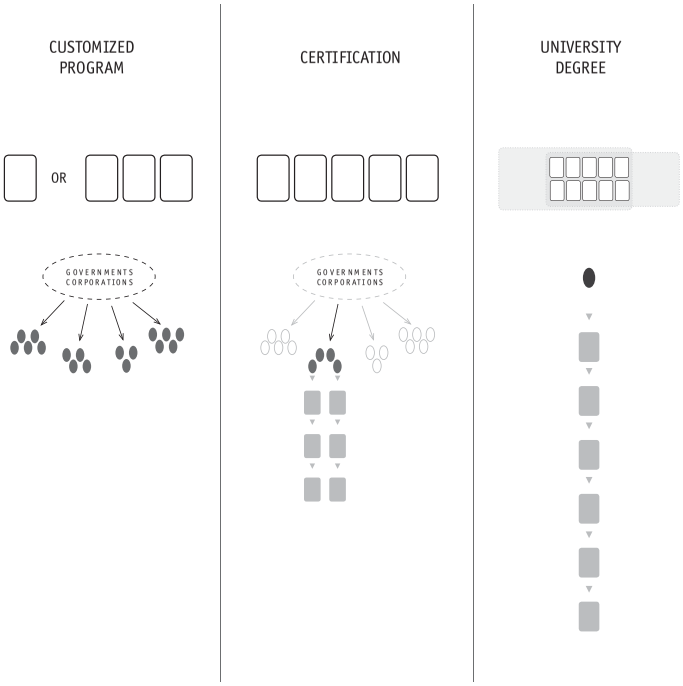
Advanced Integrated Bioclimatic Design
Advanced Principles of Ecological Design
Alternative Materials and Construction
Biomimicry
Biophilia
Environmental Basics and Issues
Environmental History
Environmental Law and Policy
History of Ecological Sciences
Brownfields
Business positioning and marketing
Charrettes and an integrative process
Climate change
Community development
Construction management
Ecological inventory
Ecological principles and BMP's
Environmental Economics
How buildings fail
Psychology of habitation (productivity and other issues)
Advanced building systems (lighting, conditioning, etc.)
Building Design and Construction
Building performance simulation and tools
Building planning and form
Commissioning
GIS
Interior environmental quality
LEED and other tools and resources
Life Cycle Assessment and Costing
Material evaluation and selection
Post occupancy evaluation and building diagnostics
Regional planning and infrastructure development
Site and Ecology
Stormwater, capture, use, technologies
Sustainable Design and Development
History of Sustainable Architecture
Indigenous Peoples' Building Methods and Materials
Integrated design process
Landscape Architecture
Organizing Principle and Nature-Based Architecture
Pattern in Nature
Permaculture and Bioremediation
Sustainable design in related fields (product manufacture, etc.)
Sustainable interior design

CUSTOMIZATION + LEVERAGE RESOURCES + BRANDING + **DEFINITION** + MULTIPLES





CUSTOMIZATION + LEVERAGE RESOURCES + BRANDING + DEFINITION + **MULTIPLES**



9.0 Outreach, Lectures, Guest Critics, Exhibitions

9.1 _ K-12 Outreach _ Architecture Explorations

The mission of Architecture Explorations is to provide an architectural foundation for children and youth which imparts a knowledge and appreciation of the built environment, encourages creative expression and critical thought, and inspires civic responsibility through hands-on design projects.

Program	Duration	Frequency	Contact Hours	2004-05 Students	2005-06 Students	2006-07 Students
Proprietary Programs						
Saturday Sequence	10 weeks	2 hours/week	20	44		
	8 weeks	2.5 hours/week	20		43	51
Academic Workshops	once	2 hours	2	15	243	115
ABC	10 weeks	1.5 hrs/week	15	10	21	8
Scouting workshops	once	1 hour	1	8		20
Partnership Programs						
Summer Camps	4 days	2 hours/day	8	10		
	5 days	2.5 hours/day	12.5		234	335
	5 days	5 hours/day	25			41
	10 days	5 hours/day	50		32	15
After School Program	4-6 weeks	1-1.5 hrs/week	4-6	94	0	20
Special Offerings						
Maltzan Charette	5 days	4 hours/day	20	15		
Total Students Served				**196**	**573**	**605**
Total Contact Hours				1,918	6,186	7,453

Saturday Sequence: Our flagship program teaches architecture through a design-centric studio environment. Classes focus on the architectural design process and creative problem solving skills. Each level has an area of focus: Grades 3+4, introduction to architecture; Grades 5+6, buildings in context; Grades 7-9, conceptual ideas; Grades 10-12, professional design process. Students are taught by upper-level architecture students and young professionals.

Academic Workshops: Our workshops are designed to meet educational standards mandated on the national, state, and local levels.

Architecture Building Communities: Designed specifically for high school students, Architecture Building Communities addresses architecture as a career choice, a creative endeavor, and a new way to look at the community in which students live. Students are exposed to different careers related to the architectural profession, learn about community-oriented architectural projects, and propose a design solution for a vacant site. For the upcoming year, this program is supported by the National Endowment for the Arts and is partnering with the Best of the Batch Foundation to focus on the community of Homestead.

Scouting Workshops: Workshops for troops help scouts earn badges and pins in architecture.

Summer Camps: Our camps are offered in partnership with the Carnegie Museum of Art, including both the education department and the Heinz Architectural Center. Each camp focuses on one topic in architecture. The Summer 2005 issue of the Carnegie Magazine elaborates on Art and Architecture Summer Camps in the article "City Planning 101."

After School Workshops: Our partnership with the Children's Museum of Pittsburgh allows us to offer after school workshops to schools providing after school programming.

9.1 _ Outreach

K-12 Architecture Explorations

This outreach initiative is a collection of architecture-based extracurricular and academic enrichment programs for students in kindergarten through high school. The programs offer a creative and engaging introduction to architecture.





Michael Maltzan Charrette

In May 2005, the Heinz Architectural Center at Carnegie Museum of Art and Carnegie Mellon University's School of Architecture invited five teams of students and professional architects to explore the building process by participating in a week-long charrette, a brainstorming design studio which culminated in a broad-ranging public discussion.






9.2 _ **Pre-College** (six week summer program)

2004 enrollment	12	6 minority scholarship students
2005 enrollment	46	12 minority scholarship students
2006 enrollment	52	5 minority scholarship students
2007 enrollment	56	5 minority scholarship students

The study of architecture is an exciting multidisciplinary activity that combines design creativity, historical perspective, technical knowledge and social responsibility. The Pre-College Architecture Program is structured to introduce you to each of these areas and for you to experience studying architecture in a university setting.

Studying architecture can change your life. Our Pre-College program intends to do exactly that. Imagine dynamic discussions about buildings, cities and design. Imagine mornings on campus learning to draw not only what you see, but also what you envision. Imagine creating images and forms with the latest digital technology. Imagine movie nights, architectural tours and lunch-time talks with remarkable architects, artists, designers and engineers. Imagine the new friends you'll make, the new ideas you'll explore and the new places you'll discover!

As a student in the Pre-College Architecture program you will:

* acquire design, drawing, model building, computer and public-speaking skills, and establish a strong knowledge base central to helping you succeed as a college freshman
* investigate principles of form, function, space and technology through the act of learning by doing
* take initiative and be given responsibility to challenge your own design abilities and critical thinking skills
* be exposed to the research, scholarship and practice of accomplished architects, artists and designers who will act as faculty and visitors, and have direct access to their work and ideas
* develop an impressive portfolio of creative work in a variety of media

Design Studio is both a course and a place. The Design Studio course will meet each afternoon. Students will work one-on-one with their design critic to develop innovative and creative proposals for design problems. You will explore human, architectural and urban problem solving through independent and collaborative projects. Students will create drawings, models and presentations of their proposals, which will be discussed in individual and group settings. Each student will have his/her own desk, drafting board, stool and model table in the studio.

Drawing introduces freehand and mechanical drawing of spatial environments - interior and exterior, architecture, still life and the human figure. A wide range of media will be explored including pencil, ink and charcoal. You will learn the basic principles of constructing two- and three-dimensional drawings such as plan, section and perspective as well as a variety of sketching and freehand drawing techniques.

Digital Media will work both independent of and integral to the Design Studio. Digital Media intends to familiarize students with the use of software applications currently employed in architecture and design practice. Students will learn the basic skills needed to create, manipulate and explore digital images, drawings and three-dimensional environments and will be expected to use them as a means to design.

Topics in Architecture

Architectural History, Issues of Professional Practice, Structures and Technology are areas of study central to architectural education and practice. Topics in Architecture will cover each of these three areas in two week sessions and will be integral to the mission and curriculum of the design studio. Students will acquire knowledge and techniques in each area vital to the development of their design and critical thinking skills. Topics in Architecture courses are taught by professors with expertise in each field - history, practice and technology.

Field Trips Essential to understanding architecture is experiencing architecture. Every Friday, students will explore Pittsburgh and the region. Field trips will include tours of significant historic and contemporary buildings like Frank Lloyd Wright's Fallingwater and the environmentally progressive Pittsburgh Convention Center designed by Rafael Vinoly. You will explore vibrant historic neighborhoods, visit city museums including the world-renowned Carnegie Museum of Art, Andy Warhol Museum and the Mattress Factory, and tour a few of the many outstanding architecture firms located in Pittsburgh.

Architecture Faculty: The Pre-College architecture faculty are Carnegie Mellon School of Architecture professors. All are practicing architects, artists or leading scholars in their fields. Teaching standards and student expectations parallel those in our college program.

9.3 _ Summer Internship for Diversity

Summer Internship for Diversity (SID) is a certificate program of the School of Architecture, Carnegie Mellon University. Its purpose is to improve the diversity of the school. President Jared Cohon has identified SID as one of the "Faces of Diversity" in the university.

The School of Architecture needs to attract African-American faculty and students, not to mention members of other underrepresented minorities. SID is intended to work in both categories. It introduces architecture upperclassmen, in particular from Howard and Hampton Universities, to research and graduate studies at Carnegie Mellon. Over the past six years of its offering, 18 interns have completed the SID program. A third of these students have gone on to earn graduate degrees. In a decade or so, we anticipate that we will be seeing some of the SID graduates among the ranks of architecture faculty here at Carnegie Mellon, as well as at other major US universities.

SID is a six week long training program. Its instruction includes topics like design in the urban realm, building economics, ethics, computer assisted design, building performance requirements, building systems, and virtual reality. Instruction is provided by Professors Omer Akin and Brock Onque and PhD students from the School of Architecture. Darlene Covington-Davis is the Coordinator of SID. Intern candidates are selected by their home institutions to apply for admission.

The interns admitted to SID stay on campus and are provided with food-plan, library access, computer use and athletic facility access, all free of charge. They are also awarded a stipend of $1,000. SID is funded entirely through contributions from members of Carnegie Mellon's administration offices, private foundations, and individual donations. In the 2007 season, Pittsburgh professional firms begun to participate in and actively support the internship program. Perkins Eastman and Edge Studio are the first participants of this program.

Curriculum

The typical instruction in SID is a combination of studio, lecture and site-seeing activities. The studio conducts a project in urban neighborhoods of Pittsburgh and the lectures introduce the interns to a number of advanced architectural research theories and tools. The interns design a solution in the studio and undertake shorter assignments in response to the lectures.

The intent is to provide a broad exposure to people, ideas, and projects to interest the interns in advanced education and academic life.

Summer Internship Program

1999	Jason Foster, Rob Crawshaw
2000	Katherine Williams, Shurmella Condell, Eric Green
2001	Kirk Mitchell, Stephen Wilder, Omar Clennon
2002	Suzannah Codlin, Cory Newton, Kenni-Ann Walker
2003	Deidre Robinson, Kris Ernandez, Stephan Lawrence
2004	Ron Graham, Rashard Willingham
2005	Kristal Aqui, Sarai Williams, Gillian Fraser
2006	Angela Khosa, Maryanne Mokoko, Kerrion Walters
2007	Billy Almon, Liselle Coker, Marcellius Sample

2001 Joint Workshop at Bauhaus, Dessau-Germany
Kirk Mitchell, Stephen Wilder, Omar Clennon

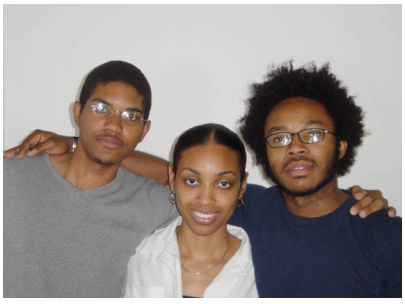
Enrolled in MSc PhD Programs

1992	James Harrison, Dale Morrissey
1997	Gerald Andersen
1998	Kanyi Masembwa
2000	Rodney Ladson
2002	Kirk Mitchell (HIP'01)
2003	Stephen Wilder
2005	Geoffrey Kavulya
2006	Kerion Walters
2007	Mustapha Bello

Graduated from MSc PhD Programs

1993 James Harrison, Dale Morrissey

2000 Kanyi Masembwa (MsCAD; Heinz'2001)
2001 Rodney Ladson
2003 Kirk Mitchell, MSA
2004 Stephen Wilder, NSA
2004 ShaVon Brown, MS-AECM
2006 Geoffrey Kavulya, MSA
2008 Kerion Walters, MUD



9.4 _ American Institute of Architecture Students (AIAS)

The American Institute of Architecture Students is a national organization with chapters in schools of architecture around the country. The Carnegie Mellon chapter carries a strong tradition of leadership, community involvement, and student participation. Student-run and organized, AIAS provides School of Architecture students with events that promote their professional and academic development and connect them to national leadership and learning opportunities.

Over one half of the CMU Architecture students are members of the AIAS (American Institute of Architecture Students), one of the largest chapters in the nation. Although the primary focus is on the architecture student, membership is open to students from all disciplines. The chapter is fortunate to consistently have members go on to National positions within the organization. The Carnegie Mellon chapter sponsors a number of social, academic and professional events throughout the year. Students have also gained exposure by being published in the AIAS Magazine, CRiT. The AIAS Professional Development Series includes seminars open to all students with topics including resume, portfolio, IDP, alternative careers in architecture, and a mock interview session. Local architects faculty and recent alumni are invited to provide important insights for students. The AIAS chapter sponsors field trips for students, including taking a group annually, to the AIAS Forum.

AIAS National Leaders from Carnegie Mellon

Caruso	Andrew	2006	AIAS National President
Fabbroni	Larry	2002	AIAS National President
Kunselman	Dave	1990	AIAS National President
Bojsza	Kate	2003	AIAS National Vice President
Malecki	Christine	1996	AIAS National Vice President

AIAS National Awards won by CMU School of Architecture Chapter

2001	Educator Award	Vivian Loftness
	Student Research	Patient Care, Carnegie Mellon University
		Matthew Blum, Timothy Brochu, Vanessa Lobue, Jeff Walch
2000	Chapter Award	Carnegie Mellon University
	Student Research	Master Plan Course, Carnegie Mellon University
1999	Chapter President	Margaret Tarampi
	Educator Award	Laura Lee

AIAS Steel City Forum: 2001 Going Beyond Green in Pittsburgh | Hosted by CMU Chapter
Forum is an annual conference of AIAS chapters from across the country. In 2001, the Carnegie Mellon University Chapter of AIAS organized and sponsored the Forum Conference, planning the speakers and events for the 3-day conference. Chaired by Christopher Reynolds, then a student in the School of Architecture, the conference focused on the ideas of sustainability in practice and research, and provided students from across the country with an introduction to the latest innovations and ideas being introduced. Keynote speakers included:

Ken Yeang, T.R. Hamzah & Yeang
Eric Owen Moss, Eric Owen Moss Architects
James Wines, SITE
Pliny Fisk, III, Center for Maximum Potential Building Systems
Will Bruder, Will Bruder Architects, Ltd.
Joylon Brewis, Nicholas Grimshaw & Partners

AIAS Northeast Quad Conference: 2006 Building a Sustainable Future | Hosted by CMU Chapter
Quad Conference is a bi-annual conference hosted by a different AIAS chapter each Fall and Spring Semester. During the Fall 2006 semester, the Carnegie Mellon University Chapter of AIAS organized and sponsored the 3-day AIAS Northeast Quad Conference. Chaired by Gregory Tanski, a then second year student in the School of Architecture, the conference hoped to examine the increasingly relevant topic of sustainable design. A tour of Fallingwater, a LEED workshop, and events throughout the City of Pittsburgh enabled students from the chapters throughout the northeast to experience what the Western Pennsylvania region contributes to innovation and education in Green design and sustainable building and technology. The keynote speaker for the event was **Martin Haas**, Parter, at Behnisch Architects. Haas is the design team leader for the Pittsburgh Cultural District Riverfront Development – a $460 million project that will be the country's first master-planned "green," mixed-use, arts/residential neighborhood.

9.5 _ I AM (Initiative for Architectural Mentorship)

At Carnegie Mellon University you are an artist, a thinker, a humanitarian, a mathematician, a leader.
As an architect, you are many things, and you only need a little mentoring to realize it.

What does mentoring mean? By definition a mentor is a wise and trusted counselor, a teacher in the sense that this person has knowledge, experience, and skills that they are willing to share with a mentee. This teacher does not have to be a traditional teacher, as in one who is hired to fulfill a role. In fact it seems that the most valuable mentoring comes from voluntary encounters outside of studio hours at times and places and people from whom you least expect it. IAM believes that a peer is the strongest kind of mentor.

Since 2004, under the direction of founder Andrew Caruso and co-coordinator Allison Lukacsy, I AM has been working to encourage collaboration throughout the School of Architecture by connecting undergraduate students to other undergraduate students who have more experience in our school's architecture program. The intent of the program is to prepare students to enter their professional practice through developing and fostering relationships that last a lifetime.

Annual events like "Engage" involve upper-class students in assisting and advising first year students with everything from how to set up their drafting boards to how to keep their new "home" full energy. This interaction provides an instant mentoring opportunity!

I AM was created to give students additional insight into the discipline and practice of architecture. It also serves to bridge the gap between education and practical experience. Through local alumni and AIA Pittsburgh, I AM has been able to link our students with professionals within our community. Last winter a tour of Pittsburgh's public artwork was co-sponsored by the Sprout Fund in Pittsburgh in partnership with Carnegie Mellon's School of Art and the School of Architecture. Lecture series and workshops independent of the School of Architecture's Lecture Series have brought professionals into our studios. Visitors include Victor Beltran of Astorino Architects, a brilliant watercolorist and architect; Ann Swager, Executive Director of AIA Pittsburgh; Tom Briney, Past-President of the AIA Pittsburgh chapter; and Carol Brown, former President of the Pittsburgh Cultural Trust and currently serving on the Heinz Endowments Board of Directors.

In 2007 I AM merged with Carnegie Mellon's American Institute of Architecture Students and is currently launching a new series of mentoring events in collaboration with first and second year studio coordinators. One of many events planned for this semester, a "melting pot" opportunity has been created for students from every year to pin up current work and discuss theory and concepts over dinner.

I AM believes that mentorship must be reciprocal, inclusive, balanced, multifaceted, evolving, and address the individual as well as the whole. The opportunities in our architectural mentoring program come from one of our strengths – our students. Our students are passionate, visionary, and committed to excellence. With that comes the challenge getting these brilliant students to step outside of their academic box and see the value in building relationships. As an organization, I AM is committed to reaching out to these students and all other students to show them that they can have a greater hand in building a stronger, better-connected community of professionals.

2005-2006 Events

September 2005	Engage			
September 2005	Chow & Chat			
October 2005	Cultural District Revitalized		Carol Brown	Former President of the Pittsburgh Cultural Trust
October 2005	Walking Tour: Cultural District			
November 2005	Sketching and Watercolor Workshop		Victor Beltran	*Astorino* and American Watercolor Society
November 2005	AIA Pittsburgh and Its Projects		Ann Swager	Executive Director of AIA Pittsburgh

2004-2005 Events

September 2004	Engage			
September 2004	Chow & Chat			
November 2004	Pittsburgh Children's Museum Premier		Art Lubetz	Carnegie Library of Squirrel Hill
December 2004	"Work Song" @ the City Theater			
February 2005	"Anatomy of a Community Mural"		Mac Howison Morton Brown	Coordinators, Seed Grants and Sprout Fund
February 2005	Lecture and Film: Variaciones		John Loomis	Freelance Photographer
March 2005	Collaborative Innovation Center Tour		Jeff Davis Kevin Gannon	Davis Gardner Gannon Pope Architecture

9.6 _ Passport

Passport is a university wide, interdisciplinary course designed to encourage and facilitate student engagement in events across the College, the University and the City of Pittsburgh. Passport requires students to attend pre-approved lectures, workshops, exhibits, films, performances and various other events sponsored by the College, the University, or a variety of institutions and organizations in Pittsburgh.

2005 enrollment 38
2006 enrollment 67
2007 enrollment 43

Through direct experience, the primary intention of Passport is to engage students in contemporary ideas and debates, encourage and support interdisciplinary work and discourse, and to stimulate an active dialogue between a student's academic pursuits and their real world experience. Passport provides a structure and means for bringing new ideas and explorations into the creative and intellectual work of the students. Participating in Passport will strengthen student's critical thinking skills and provide them with a structure and foundation to further develop their interests in scholarship, research, practice and creative production.

Passport can be taken as a year long or semester course. Students will be required to attend 45 hours of pre-approved events. Students are free to choose the type and schedule of the events they attend, having over 75 events each semester from which to choose. Events will include dramatic performances, art, architecture and design exhibits, lectures and workshops sponsored by many disciplines, films, concerts and conferences. Additionally, students will be required to keep a journal of their passport experience and attend small, dynamic 1 hour discussion session every other week.

Passport is not just a course -- it's a cultural shift. Experiencing the world around you will undoubtedly transform you, your work and your thinking. Are you ready?

Passport Journals You are required to keep a journal of your passport experiences. The size and format of your journal is up to you. Journals should include ticket stubs, playbills, flyers, postcards and/or other printed material related to the events you choose to attend. Journals will also include written and sketch responses to the events you choose to attend. Written responses should be thoughtful, intelligent, well written critiques of your observations and experiences. Additionally, you should record, in your journal, ways in which you feel/think/see your passport experiences having an effect on your own creative or intellectual work. Journals will be collected and checked once at mid semester and once at the end of the semester. Please note: At the beginning of each journal entry, clearly indicate the amount of time you spent at the event, e.g., “Lecture: 2 Hours.”

Passport Discussion Sessions We will meet as a group every other week for a 1 hour discussion. Discussion groups will be no larger than 12 students. You will be expected to attend the discussion sessions prepared to talk about the events you have attended and your critique of and response to the events. All discussion sessions will take place in my office, you will be required to bring your Passport journal to the discussion sessions.

Passport Events Not every event offered by every school, department or organization will count toward Passport. All events, exhibits, films and readings are listed and updated on the Passport website www.arc.cmu.edu/passport. You will receive weekly e.mail with a listing of all highlight events. If there are events happening that are not on our list that you would like to attend and think should count please let me know. I am open to adding events to our list if they meet Passport requirements. To complete the course, you will be required to attend a total of 45 hours of events. You are certainly free to attend more. I highly recommend that you attempt to attend at least one-two events per week.

> **Events** include lectures, performances, concerts, openings, conferences, symposia, and short or one run films.
> **Exhibits** are listed by opening date. Students should plan to spend a minimum of one hour viewing an exhibit.
> **Film** houses and film series are included. Refer to the film house or series sponsor for a listing of dates and times.
> **Readings** are provided to either complement current events or to introduce material to spur discussion.

The Rules Passport is a Pass/Fail course. Attendance at ALL discussion sessions is required, no exceptions. Journals must be submitted twice a semester with sufficient evidence of attendance to the required number of event hours. Incomplete journals or any discussion session absences will result in course failure.

9.7 _ School of Architecture Lecture Series

2007/08

Oct 8	Greg Lynn		
Oct 22	Anthony Burke		
Nov 16	Juan Busquets		

2006/07

Oct 9	Duany and Plater-Zyberk	DPZ Associates	David Lewis Lecture by Urban Design Associates
Oct 13	George Stiny	MIT	
Jan 19	David Adjaye	Adjaye Associates	Jill Watson Memorial Lecture
Jan 19	Elizabeth Diller	Diller, Scofidio, Renfro	Jill Watson Memorial Lecture
Jan 29	Fritz Haeg	Fritz Haeg Studio	Alumnus
Feb 26	Gerard Damiani	Studio D'Arc	Epic Metals Lecture
Mar 19	Allison Williams	Perkins + Will	Hans Vetter Memorial Lecture
Mar 26	Mark Wigley	Columbia University	William Finglass Lecture
Apr 2	Anthony Vidler	Cooper Union	
Apr 23	Adam Caruso	Caruso St. John Architecture	Henry Hornbostel Lecture
May 11	Hansy Better Barraza	Studio Luz	Fifth Year Show Lecture

2005/06

Mar 25	Michael Maltzan	Michael Maltzan Architecture	
Sep 26	Leon Krier	Leon Krier Architect	David Lewis Lecture by Urban Design Associates
Oct 27	John Sergio Fisher	John Sergio Fisher Architect	
Jan 30	Andrew Zago	Zago Architecture	William Finglass Lecture
Feb 6	Niall McLaughlin	Niall McLaughlin Architects	
Feb 13	Mira Nakashima	George Nakashima Woodworker	
Feb 20	Hadrian Predock	Predock Frane Architects	Hans Vetter Memorial Lecture
Feb 27	Arthur Lubetz	Arthur Lubetz Associates	
Mar 20	Monica Ponce de Leon	Office dA	
Apr 3	Mack Scogin	Mack Scogin Merrill Elam Architects	
Apr 10	Peter Stamberg/Paul Aferiat	Stamberg Aferiat Architecture	
Apr 24	Roger Duffy	Skidmore, Owings & Merrill	Henry Hornbostel Lecture

2004/05

10 Sept	Lebbeus Woods		
23 Sept	Tasman Storey		
06 Oct	John Norquist		David Lewis Lecture by Urban Design Associates
14 Oct	Julie Eizenberg		
21 Jan	Craig Hodgetts		
13 Feb	John Loomis		
25 Feb	Michael Maltzan		
28 Feb	Gary Carlough		
3 Mar	Petra Blaisse		
21 Mar	Taryn Christoff / Martin Finio		
24 Mar	Len Auerbach		
01 April	Front Studio (Yen Ha | Ostap Rudekevych)		
12 April	Julie Bargman		
18 April	Larry Scarpa		Henry Hornbostel Lecture

Pittsburgh Architecture Lecture Series
Sponsored by the School of Architecture | Carnegie Mellon University, The Heinz Architectural Center | Carnegie Museum of Art, Pittsburgh History and Landmarks and the American Institute of Architects, Pittsburgh Chapter.

Fall 2000

Will Bruder	Nov. 14, CMU Chosky Theater, (Wats:on Festival)
Peter Sulzer	"Jean Prouvé," Nov. 14, CMU Breed Hall
Dr. Harriet Senie	"Memorials & Memory," Nov. 14, CMU McConomy Hall
Dr. Bharat Dave	"Bits of Digital Imagination," Nov. 20, Breed Hall

Spring 2001

Joseph Rosa "Folds, Blobs + Boxes" Feb. 19, Carnegie Museum of Art Theater

Preston Scott Cohen, Brendan McFarlane, Sulan Kolotan, Joan Ockman
Architecture in the Digital Realm, panel discussion with. Mar. 3, Carnegie Museum of Art Theater

Bill Sharples "ShoP Architecture," Mar. 19, CMU Doherty 2210 Presented by Heinz Architectural Center

Rafael Longoria "Explorations in Context" Mar. 20, CMU Doherty, 2235

Dennis Ruth Co-Director, "Rural Studio, Auburn University," Apr. 11, Carnegie Museum of Art Theater

Suha Ozkan Director, Aga Khan Awards, Apr. 16, CMU Doherty, 2210

Stephan Behnisch "Situational Architecture," Fri. Apr. 27, CMU Breed Hall (Hornbostel Lecture)

Spring 2002

David Walker "Transformations in Government," Feb. 26, CMU Hamburg Hall

Adam Yarinsky "ARO: Research in Practice," Mar. 18, Doherty 2210 Presented by Heinz Architectural Center

Wilvan van Campen "It's Not Modern.... Just Cheap," Mar. 21, CMU Doherty 2235

Paul & David Lewis "Architecture & Water" Mar. 23, Carnegie Museum of Art Theater

Gordon Clark "Crisis of European Pensions" Mar. 25, CMU Adamson Wing

Carol Ross Barney "4½ Stories on Masonry," Apr. 10, CMU Doherty (Masonry Lecture)

Riadh Tappuni "Conflict, Cities & Reconstruction," Apr. 15, CMU MM A14

Eberhard Zeidler "Integrating Architecture with Life", Apr. 24, CMU Doherty 2210 (Hornbostel Lecture)

Raimund Abraham "Eyes Digging," Apr. 30, Carnegie Museum of Art Theater

Fall 2002

Michael Sorkin Michael Sorkin Studios, Sept. 18, (Wats:on Festival)

Donlyn Lyndon First Annual David Lewis Urban Design Lecture, Sept. 18, Carnegie Museum of Art Theater

Jacob Alspector Fitz-Gibbon Chair, "Escaped From New York," Nov. 5, CMU MM103

Spring 2003

James Turrell "Plato's Cave and the Light Within", Carnegie Museum of Art

Steve Badanes "Architect as Artisan & World Citizen," Jan. 13, CMU McConomy Auditorium

William McDonough "Cradle to Cradle," Feb. 3, CMU McConomy Auditorium

Frank Barkow Barkow-Leibinger, Berlin, "Matters of Fact," Apr. 2, CMU MM103

Ada Tolla & Giuseppe Lignano, LOT/EK, Apr. 4, Terminal Buildings, Southside (as part of the 5th year show)

Edwin Chan Gehry Partners, "@foga.com," Apr. 14, Hornbostel Lecture, McConomy Auditorium

Spring 2004

Aaron Betsky "False Flat: Why Dutch Design Will Save You" Netherlands Architectural Institute, Rotterdam
February 7, Carnegie Museum of Art Theater

Gilles Saucier "Childhood Landscape - Topographic Unfoldings" Saucier + Perrotte Architects, Montreal
February 23, Carnegie Museum of Art Theater

Hani Rashid Asymptote Architecture, New York March 15, CMU – Giant Eagle Auditorium

Guenter Nitschke The 2004 Hornbostel Lecture "The Enigma of Empty Space in Japanese Gardens and Architecture"

Howard Davies "Grounded" Atelier Big City, Montreal March 25, Carnegie Museum of Art Theater

Louisa Hutton "Give and Take" Sauerbruch Hutton Architekten, Berlin April 1, Carnegie Museum of Art Theater

9.8 _ Visiting Critics

The following is a list of professionals from a variety of disciplines who have been invited to our school to provide criticism and feed back to our students about their design projects. All lecturer's from the Pittsburgh Architecture Lecture Series served as critics.

Visiting Critics: National and International

Jacob Alspector	Architect	Alspector & Anderson	NYC
Al Anderson	Project Director	Community Leader & Public Works	Osage, WV
Len Auerbach	Principal	Auerbach, Pollock, Friedlander	San Francisco
Yoshihiko Baba	Urban Planner	Kyoto Center for Collaboration	Kyoto, Japan
Brian Bell	Architect	Bldgs, Inc.	Atlanta
Aaron Bentley	Assistant Professor	Sci-Arc	Los Angeles
Greg Bradshaw	Principal	Avro KO	NYC
David Bott	Associate	Buro Happold	NYC
Lloyd Bray	Architect	Mack Scogin Merrill Elam Architects	Atlanta
Elizabeth Cardona	Principal	NC Office	Miami, FL
Edwin Chan	Senior Partner	Frank Gehry	Los Angeles
Gordon Clark	Head, School of Geography	University of Oxford	UK
Xavier Costa	Dean	Elisava School of Design	Barcelona
Fiona Cousins	Mechanical Engineer	ARUP	NYC
Howard Davies	Partner	Atelier Big City	Montreal, Canada
Tom Dawes	Structural Engineer	ARUP	Boston
Dennis Doordan	Professor	University of Notre Dame	Indiana
Geert Driessen	Principal	Bob Van Reeth Architects	Antwerp
Julie Eisenberg	Partner	Konig Eisenberg	Los Angeles
Merrill Elam	Partner	Mack Scogin Merrill Elam	Atlanta, GA
Jacki Englehard	Director	Scotts Run Settlement House	Osage, WV
Richard Fleischman	Principal	Richard Fleischman Architects	Cleveland
Ari Georges	Assistant Professor	FLW School of Architecture	Phoenix
Merrill Elam	Architect	Mack Sogin Merrill Elam Architects	Atlanta
Richard Foqué	Dean and Professor	Henry van de Velde Institute	Belgium
Ben Fry	Visiting Professor	MIT Media Lab	Cambridge
Mark Gage	Architect	Mark Gage Architect	NYC
Ari Georges	Associate Professor	Taliesen West	Arizona
Pavel Getov	Architect	Morphosis	Los Angeles
Yen Ha	Principal	Front Studio	NYC
Stephen Harby	Architect and Water Color Artist	Yale University	New Haven
Lori Hashimoto	Intern	Caldwell Architects	Los Angeles
Venessa Hattoum	Architect	Hariri Pontarini Architects	Toronto
Eric Heiman	Principal	Volume Design	San Francisco
Craig Hodgetts	Principal	Hodgetts + Fung	Los Angeles
James Housefield	Assistant Professor	University of San Antonio	San Antonio
Andre Kamili	Associate	Shepley Bulfinch	Boston
Maria Kaika	Professor, School of Geography	University of Oxford	(UK)
Stuart Knoop	Principal	Oudens + Knoop	Bethesda, MD
Fred Koetter	Principal	Koetter Kim	Boston
Patricia Kucker	Associate Professor	University of Cincinnati	Cincinnati
Perry Kulper	Architect/Professor	University of Michigan	Ann Arbor
James Kuo	Solutions Manager	Cap Gemini	NYC
Frank Kutlak	Project Officer	NIH	Bethesda, MD
Bruce Lindsey	Architect/Dean	Washington University	St. Louis
Kristy Long	Division Mgr, Design/Construction	NIH	Bethesda, MD
Donlyn Lyndon	Principal, Professor, UC Berkeley	MLTW	Berkeley
Marvin Malecha	Dean and Professor	North Carolina State University	Raleigh, NC
Jacob Mandel	Artist		NYC
Andrea Mastrandrea	Architect	Paper Space	Toronto
Michael McMackin	Principal	Auerbach, Pollock, Friedlander	San Francisco
William Mitchell	Head, Media Lab	MIT	Cambridge
Roger Morgan	Theater Consultant/Lighting Designer	Sachs Morgan Studio	NYC
Jason Morris	Master Student	University of Illinois Chicago	Chicago
Nikolay Nedev	Principal	NC Office	Miami, FL
Gunter Nitschke	Director	International Asia Arch / Urban	Germany

John Norquist	President, Congress for New Urbanism	Former Mayor of Milwaukee	Chicago, IL
Mark Ours	Assistant Professor	Ohio State University	Columbus, OH
Mark Pasnik	Assistant Professor	Wentworth Institute of Technology	Boston, MA
Ben Pell	Co-founder	PellOverton	NYC
Ian Rawson	Administrator	l'Hopital Albert Schweitzer	Haiti
Lucy Rawson	Director	Friends l'Hopital Albert Schweitzer	Haiti
Joseph Rosa	Curator of Architecture and Design	San Fran MOMA	San Francisco
Elliot Rothman	Principal	Rothman Partners Architects	Boston
Ostap Rudekevych	Principal	Front Studio	NYC
Nino Saggio	Professor	La Sapienza	Rome, Italy
Jim Saisakorn	Architect	Sidnam Petrone	NYC
Mack Scogin	Principal	Mack Scogin Merrill Elam architects	Atlanta
Kimberly Shoemake-Medlock	Architect	Mack Scogin Merrill Elam architects	Atlanta
Osamu Shoji	Master Craftsman and Instructor	Shinrin Takumi Juku	Japan
Rusty Smith	Associate Professor	Auburn University	Auburn
Damian Soffer	Developer	Soffer Organization	Pittsburgh
Billie Tsien	Partner	Todd Williams Billie Tsien	NYC
Wilvan Van Campen	Architect	Van Campen Architects	NYC
William Vinyard	Architect	Vinyard Architects	Washington
Tod Williams	Partner	Todd Williams Billie Tsien	NYC
Michi Yanagishita	Architect	AvroKo	NYC
Jason Young	Associate Professor	Wetsu / Univ. Michigan	Ann Arbor
Andrew Yalcin	Architect	Andrew Yalcin	NYC
Andrew Zago	Founder	Zago Architecture	NYC

Visiting Critics: Pittsburgh

Lucia Aguirre	Architect	DGGP
Drew Armstrong	Department Head of Architectural Studies	University of Pittsburgh
Adam Beaulieu	Intern	Edge Studio
Robert Beckjord	Architect & Design Director	LD Astorino Architects
Jen Bee	Architect	Edge Studio
Rebecca Brice	Architect	Bohlin Cywinski Jackson
Christine Brill	Intern	Pfaffmann & Associates
Donald Carter	Managing Principal	Urban Design Associates
Lucian Caste	Architect and Developer	University Trustee
Anne Chen	Architect	Edge Studio
Warren Cicconi	Borough Manager	Swissvale
Vicky Clark	Art Critic	Pittsburgh Tribune
Freddie Croce	Architect	Inter*Architecture
Bill Curran	Architect	Perkins Eastman
Syl Damianos	Principal	DamianosGroup Architects
Stefani Danes	Principal	Perkins Eastman
Jim DeCecco	Architect	Pfaffmann & Associates
John DeLuca	Mayor	City of Monessen, PA
Rich DeYoung	Principal	WTW Architects
Craig Dunham	VP Facilities	Carnegie Museum of Art
Jonathan Eggert	Intern	EDGE Studio
Herb Elish	Director	Carnegie Library of Pittsburgh
Richard Feder	Director	Port Authority of Allegheny County
John Fennari	Architect	Desmone & Associates
Lori Fitzgerald	Architect	Perkins Eastman
Scott Fitzgerald	Architect	Perkins Eastman
Pat Ford	Director	City Planning Dept.
Felix Fukui	Principal	Fukui Architects
Gregory Galford	Architect	Perkins Eastman
Joseph German	Architect	Design Alliance
Anton Germishuizen	Partner	Burt, Hill, Kosar, Rittelmann
Raymond Gindroz	Managing Principal	Urban Design Associates
Susan Golomb	Director of City Planning	City of Pittsburgh
Court Gould	Director	Sustainable Pittsburgh
Michael Gwin	Architect	Bohlin Cywinski Jackson
Tim Hadfield	Artist	Robert Morris University

Tiffany Haile	Intern	Urban Design Associates
Greg Hall	Architect	Edge Studio
Kerry Handron	Director Earth Theatre	Carnegie Museum of Natural History
Henry Hanson	Founder	Hanson Associates Landscape Architects
Chris Haupt	Architect	Kimbell
Jonathan Hayes	Architect	Bohlin Cywinski Jackson
Mike Hill	Architect	Edge Studio
Erik Hokansen	Partner	Pfaffmann & Associates
Murray Horne	Curator	Wood Street Gallery, Cultural Trust
Jon Jackson	Principal	Bohlin Cywinski Jackson
Sheila Jackson	Head Librarian	Carnegie Library of Pittsburgh
Gil Kauffman	Structural Engineer	Atlantic Engineering
Joel LeGall	Architect	LeGall Landscape Architect
Lillie Liu	Architect	Edge Studio
Barry Long	Principal	Urban Design Associates
Anne-Marie Lubenau	Executive Director	Community Design Center of Pittsburgh
Dutch MacDonald	Principal	Edge Studio
Pamela Maklin	President	Wilkinsburg Council
Peter Margittai	Architect	Peter Margittai Architect
John Martine	Architect	Strada LLC
Breen Masciotra	Associate	Community Design Center of Pittsburgh
Josh McCullar	Architect	SMBW
Jerry Merinzel	Architect	Port Authority of Allegheny County
John Miki	Intern	Urban Design Associates
Mark Mondor	Architect	Evolve
Gerald Morosco	Principal	Morosco Architects
Gary Mosier	Principal	DGGP Architects
Andrew Moss	President	Moss Architects
Tom Murphy	Mayor	City of Pittsburgh
Tracy Myers	Curator	Heinz Architectural Center
Swee Hong Ng	Intern	Edge Studio
Bob O'Connor	Councilman	City of Pittsburgh
Terry Odon	Architect	Rothschild Doyno Architects
Paul Ostergaard	Principal	Urban Design Associates
James O'Toole	Shop Director	Astorino
Bill Peduto	Councilman	City of Pittsburgh
Chris Pegher	Architect	Lami Grubb
Rob Pfaffman	Principal	Pfaffmann & Associates
Amy Poettinger	Intern	Celli Flynn Architects
Tom Price	Architect	Strada LLC
Bob Reppe	Zoning Administrator	City of Pittsburgh
George Rieke	Intern	Perkins Eastman
Tim Roose	Architect	Edge Studio
David Saint Jacques	Designer	dsjDESIGN
John Schneider	Structural Engineer	AES Engineers
Paul Schreiber	Owner	Schreiber Realty
Lisa Schroeder	Director	Pittsburgh's Riverlife Taskforce
Roxanne Sherbeck	Architect	Bohlin Cywinski Jackson
Ed Shriver	Principal	Stada LLC
Jeremy Smith	Intern	City Planning/Building Dept
Dina Snyder	Architect	Fukui Architects
Damian Soffer	CEO	The Soffer Group
Dana Stanik	Architect	Bohlin Cywinski Jackson
Iris Stehle	Architect	WTW Architects
Ken Stehle	Architect	WTW Architects
Mike Stern	Architect	Strada LLC
Jill Swenson	Architect	Burt, Hill, Kosar, Rittelmann
Mark Valenti	Partner	Sextant Group, Inc.
Lisa Vavro	Head of Landscape Architecture	Chatham University
Jason Vrabel	Assistant Executive Director	Community Design Center of Pittsburgh
Kevin Wagstaff	Principal	Perfido Weiskopf Architects
Alan Weiskopf	Principal	Perfido Weiskopf Architects

Wanda Wilson	Neighborhood Planner	Pittsburgh Department of City Planning
Alex Wing	Architect	Burt, Hill, Kosar, Rittelmann
David Wohlwill	Lead Transit Planner	Port Authority of Allegheny County
Mike Wuerthele	Structural Engineer	Whitney Bailey Cox, Magnanni
Wilbert Young	Mayor	Borough of Wilkinsburg
Jack Williams		Architect Perkins Eastman Architects

Visiting Critics: Carnegie Mellon University

Cletus Anderson	Professor	School of Drama
Linda Anderson	Director Enrollment Services	Administration
Martin Aurand	Architectural Librarian and Archivist	Hunt Library
Guy Blelloch	Professor	School of Computer Science
William Brown	Professor of Biology	Mellon Institute
Lowry Burgess	Professor	School of Art
Jennifer Church	Associate Dean, Student Affairs	Administration
Catherine Copetas	Assistant Dean, Computer Science	Robotics
Carrie Doonan	Associate Teaching Professor, Biology	Mellon Institute
Bill Elliott	Vice President for Enrollment	Administration
Stephanie Flom	Fellow	Studio for Creative Inquiry
Richard Florida	Professor	Heinz School of Public Policy
Jamie Gruzska	Adjunct Professor	School of Art
Mark Kamlet	Provost	Administration
Linda Kaufmann	Teaching Professor of Biology	Mellon Institute
Robee Baker Kosak	Vice President for Advancement	Administration
Frank Kutlak	Project Officer	Administration
Don Marinelli	Director and Professor	Entertainment Technology Center
Mike Murphy	Dean of Student Affairs	Administration
John Oduroe	Fellow	Studio for Creative Inquiry
John Papinchak	Director of Enrollment Services	Administration
Karen Stump	Teaching Professor, Chemistry	Mellon College of Science
Joel Tarr	Richard Caliguri Professor of History	College of Humanities
Paul Tellers	Campus Architect	Facilities Management
Zuhal Ulusoy	Visiting Architect, Ankara, Turkey	Gazi University
Manuela Veloso	Professor	School of Computer Science
Beth Yazembowski	Senior Administrative Associate	Administration

Faculty at Design Reviews

Faculty at Design Reviews

Faculty at Design Reviewsfire

Guest Critic Craig Hodgetts

Guest Critics Mel Bochner and Michael Van Valkenburgh

Guest Critic Julie Eisenberg

9.9 _ Exhibitions

The School of Architecture
The School of Architecture regularly exhibits student work. Cabinet spaces are dedicated to each year (1 through 5) for student work in progress. Changing exhibits of student work, travel, or independent projects are displayed in the CFA 201 gallery. The graduating class organizes an annual show of their work during graduation, typically celebrated with an opening party. In recent years this event has been held off campus at a variety of interesting industrial and commercial spaces and has drawn over 250 people to the opening event.

2004 Shift: Exhibit of Student Work at Edge Gallery
2004 Exhibit of Student Work at the Mode Museum, Antwerp
2005 Threads: Exhibition of Faculty Work
2005 100 Years of Student Work in Hunt Library
2006 Beyond Media Exhibition in Florence, Italy
2007 Wrinkles in the Cultural District, Pittsburgh

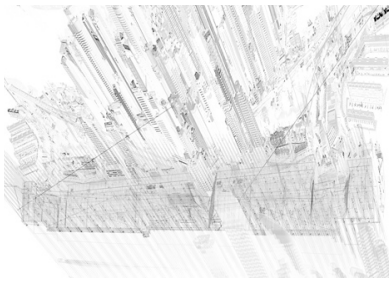
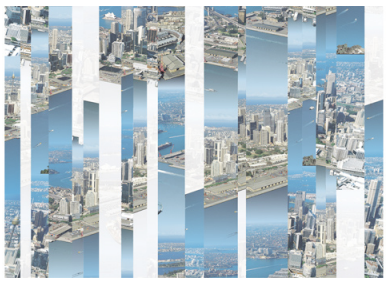
2005 Fifth Year Show: Fuse
2006 Fifth Year Show: Wake
2007 Fifth Year Show: Reproduction
2007 Carnival Booth at CMU

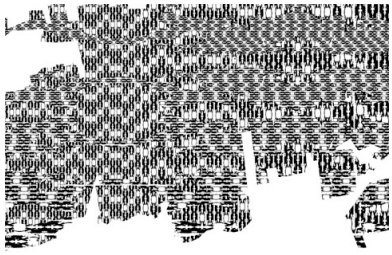
Regina Gouger Miller Gallery
is located in the Purnell Center for the Arts on the Carnegie Mellon campus, represents work of all five schools in the College of Fine Arts including the School of Architecture.

The Frame Gallery
is a student-operated gallery located at the edge of campus on Forbes Avenue and Margaret Morrison Street that hosts weekly student exhibitions. The work of architecture students is regularly featured.

The Gallery @ EDGE studio
is a curated exhibition series featuring the work of international design professionals and Pittsburgh's young designers. The goal of the series is to make professional peers and potential employers more accessible to young designers while raising the profile of the regional design community in general. Events are free to the public, but targeted specifically to the community of young architects and designers. They are intended to provide an ongoing, street-level dialogue within the Pittsburgh design community: the type of forum where design and architecture can by publicly discussed, debated and celebrated. Six adjunct members of our faculty are members of EDGE Studio.

SPRINGBOARD Space
is an exhibition space within faculty member Paul Rosenblatt's professional studio, devoted to supporting emerging artists working in new media. Rather than exhibit SPRINGBOARD's work in this alternative art space, they share their enthusiasm for the arts with visitors by exhibiting the work of young artists and others who have never before exhibited their work in public. This alternative space helps to communicate their commitment to integrating art and other non-architectural factors into architectural production. The audience is not the typical art gallery crowd; it includes clients, consultants, contractors, vendors, product reps, and others.


Continuum at the Pittsburgh Cultural Trust Gallery
Anthony Burke (University of Technology, Sydney) and David Burns (Carnegie Mellon University School of Architecture) present a transcontinental collection of experimental student work, interrogating the potentials of generative informatic processes and hallucinative sequences in architecture and design.

The Heinz Architectural Center Carnegie Museum of Art, 4400 Forbes Avenue, Pittsburgh PA
remains an important exhibition resource for the CMU architecture community. The gallery is within walking distance of the school and regularly presents regional, national and international architectural work. The following are brief descriptions of a sample of exhibitions offered recently.

On a Grand Scale: The Hall of Architecture at 100 September 22, 2007 – January 27, 2008

Architecture Exploration June 18 – August 17, 2007
Exhibition drawn from HAC collection, in connection with architecture camps offered iwith CMU School of Architecture

Gritty Brits: New London Architecture January 20 – June 3, 2007
Adjaye/Associates, Caruso St John Architects, FAT, Níall McLaughlin Architects, muf, and Sergison Bates architects

Connections: the West End Pedestrian Bridge Competition September 22 – December 10, 2006
Prize-winning proposals by Endres Ware (Berkeley, CA), La Dallman (Milwaukee, WI) and West 8 (Rotterdam, The Netherlands).

Barns of Western Pennsylvania: Vernacular to Spectacular February 4 – May 28, 2006

Frank Lloyd Wright: Renewing the Legacy October 1, 2005 – January 15, 2006
The Darwin D. Martin House, Buffalo, NY and the Price Tower, Bartlesville, OK: Past and Future

Michael Maltzan: Alternate Ground February 12 – June 12, 2005
Contemporary residences, including notable houses in Beverly Hills and Malibu, educational complexes, and buildings for art.

Lebbeus Woods: Experimental Architecture July 31, 2004 – January 16, 2005
Widely considered one of the most innovative experimental architects working today.

Terrain Vague: Architecture and Post-Industrial Landscape March 20 – June 20, 2004

Forum 53: Garofalo Architects November 28, 2003 – April 4, 2004
Experiments with new materials, technology, and programs in addition to a series of actual construction projects.

Strangely Familiar: Design and Everyday Life November 8, 2003 – February 15, 2004
Examination of contemporary design culture (1998 to 2002) brings together more than 40 innovative projects from around the world.

Pittsburgh Platforms: New Projects in Architecture + Environmental Design June 28 – October 5, 2003
Nineteen projects by Pittsburgh-based or Pittsburgh-trained architects and designers.

Windshield: Richard Neutra's House for the John Nicholas Brown Family March 1, 2003 – May 25, 2003
A lost landmark of modern architecture and the extraordinary architect-client relationship that produced the Windshield House.

TransModernity: Contemporary Austrian Architects March 1 – May 25, 2003
Completed projects and buildings by three Austrian firms–henke un schreieck, Jabornegg & Pálffy, and Riegler Riewe

Out of the Ordinary: The Architecture and Design of Robert Venturi, Denise Scott Brown and Associates
November 8, 2002 – February 2, 2003

Architecture + Water February 9 – June 2, 2002
Concerned that contemporary waterfront projects tend to lack compelling design sponsored by Van Alen Institute, New York

Perfect Acts of Architecture September 15, 2001 – January 6, 2002
Consummate achievements of five architects who redefined the architectural drawing in the mid-1970s and '80s

Landscapes of Retrospection: The Magoon Collection of British Drawings and Prints, 1739-1860 and Still Rooms & Excavations
A Photographic Installation by Richard Barnes June 9 – September 2, 2001
At first glance, the works in these two exhibitions are distinct in medium, historical period, and explicit subject matter; but closer consideration reveals intriguing parallels in terms of their themes, the questions raised, and the issues central to both exhibitions.

Folds, Blobs + Boxes: Architecture in the Digital Era February 3 – May 27, 2001
How the computer, in the past decade, has significantly changed architects' perceptions of space.

9.9 _ Exhibitions

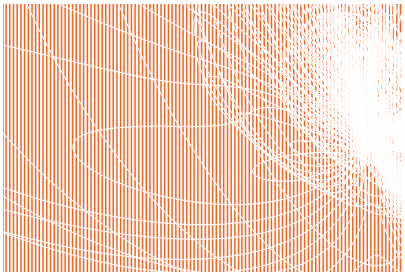
Beyond Media

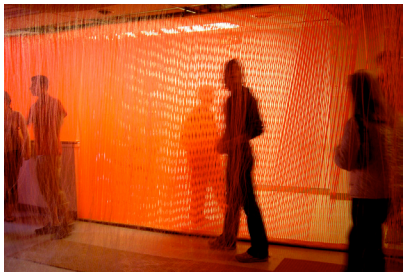
By utilizing common construction materials, the students created a dynamic, fluid form that is inherently interactive, yet does not rely on projection, verbal information or any advanced technologies. The individual activates the installation by simply navigating the space and engaging the curvilinear form.



Wrinkles

How can architecture, of any scale, reflect temporal patterning? Students from a seminar led by David Burns presented an investigation of entropy and the ephemeral.



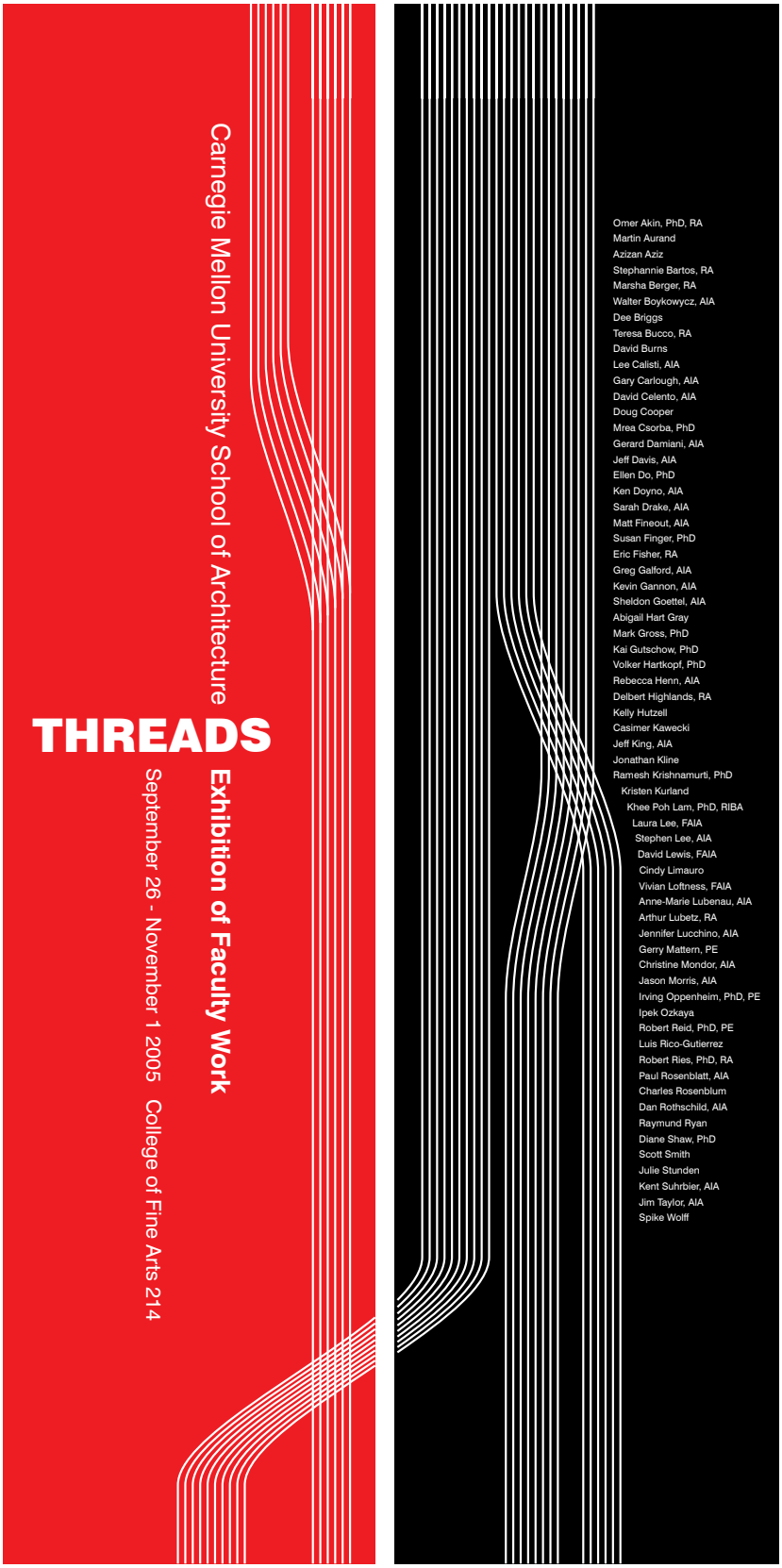


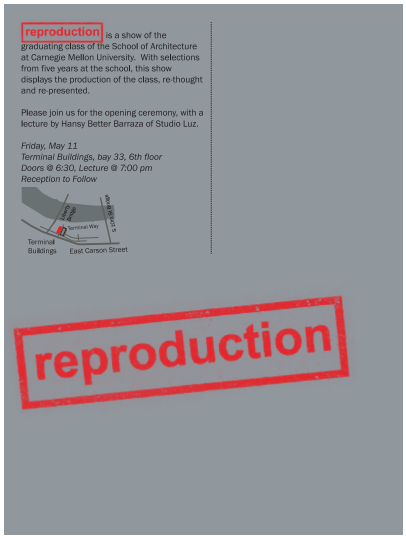
2007 Carnival Booth

At the 2007 Carnival, the archibooth drew a lot of attention. It used a sustainable building materia--recycled bottles--to create a unique experience. The booth included four infared sensors, two flood lights, and LEDs in the bottles. When the sensors picked up movement, the flood lights would turn on.



9.9 _ Exhibitions





10.0 Special Programs and Projects

10.1 _ Special Programs and Projects

Solar Decathlon

Carnegie Mellon University's Schools of Architecture, Design, Art and Drama were selected to participate in the US Department of Energy's 2007 Solar Decathlon competition. The faculty team is committed to using the competition to enable enhanced learning about energy-effective residential design for a broad base of constituents. By utilizing very public locations for the construction activities, for the competition and for the permanent installation of the house, the team will be able to successfully raise awareness of energy-effective design beyond the campus community. To this end, the four schools from the Carnegie Mellon College of Fine Arts (CFA) are partnering with the Pittsburgh construction industry, Construction Junction, and the Carnegie Museum of Natural History's Powdermill Nature Reserve (PNR)to design, build, operate and exhibit 2007 Solar Decathlon house.

The Solar Decathlon is an international collegiate competition sponsored by the Department of Energy and the National Renewable Energy Lab. Twenty teams, including Carnegie Mellon, have been selected by the DOE to compete in 2007. This will be Carnegie Mellon's third Solar Decathlon competition. Carnegie Mellon's team is an interdisciplinary mix of students, faculty and staff from the Schools of Architecture, Art, Design, Drama as well as engineering, business and other non-university related groups.

Each Solar Decathlon competition is a two-year long process in which competing student teams design, assemble/ disassemble, and operate energy-efficient solar-powered houses while complying with the criteria associated with the 10 contests that comprise the competition. For two weeks in October, a village of solar homes is on exhibit for over 150,000 visitors on the National Mall in Washington DC – providing a showcase where students can demonstrate their ideas and research, as well as interact with public visitors, numerous government and industry representatives along with media representatives from all over the world. Contest rules require that each house generate enough energy to operate a household, a home-based business and related transportation needs.

The long-term goal of the Solar Decathlon is to lessen our reliance on fossil fuels, to achieve energy independence and to increase the market share of renewable energy. In order to accomplish this, student teams are challenged to develop strategies and to create designs to make renewable energy costs comparable to that of fossil fuel-generated power by the year 2015. At the same time, the live/ work prototype homes designed by the students must also demonstrate a high quality lifestyle and respond to consumer needs and aspirations.

The Carnegie Mellon team is supported by broad array of Pittsburgh–based companies, trade workers, foundations and Carnegie Mellon. Alcoa, TRACO, Bayer Materials Science, the Hardwood Manufacturers Association, Follansbee Roofing and Centria made major product donations. The Pittsburgh Builders Guild organized trainers and apprentices to work with the student construction team. The construction community made major product, labor and cash contributions, while Construction Junction hosted the construction team at their facility in Point Breeze.

The Solar Decathlon competition directly addresses the educational mission of Carnegie Mellon. Competing in a prominent international student competition and placing a student–built structure as an educational resource dedicated to environmental issues is symbolic of everything Carnegie Mellon stands for – fusing art and technology, collaborating on a multi–disciplinary basis, improving energy effectiveness and environmental responsibility, learning in a hands–on fashion and impacting regional and global issues. The project has made a major positive impact on all the participants – the students and trade workers that were and are currently involved will become the future leaders that help us create a sustainable world. At our Monday meetings, one can count over seventy students that are participating this semester alone and anticipate funding a "build" crew this summer of twenty-four students.

10.1 _ Solar Decathlon

2002 ReSOLution

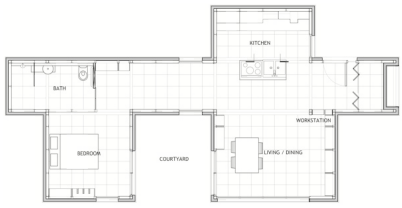
Resolution means analyzing a complex notion into simpler parts; ReSOLution is our process of analyzing sustainable lifestyles from the perspective of residential energy supply. By emphasizing SOL, we relate our project directly to the sun. Our slogan 'Sustainable Living Through Solar Power' reinforces the practical nature of our project and the need to integrate multiple systems to support the vitality of an urban lifestyle.

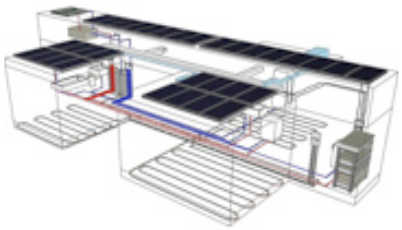
2005 Pittsburgh Synergy

The Pittsburgh team is also emphasizing modularity, flexibility, and adaptability in all of the spaces and building components.

2007 tripod

Urban design is a fundamental sustainable design strategy and in combination with building-based sustainable design strategies including passive and active solar systems can create communities with an improved quality of life for current and future generations. The plug and play design in 2007 will demonstrate the ways in which basic building blocks can be re-configured to suit multiple contexts.



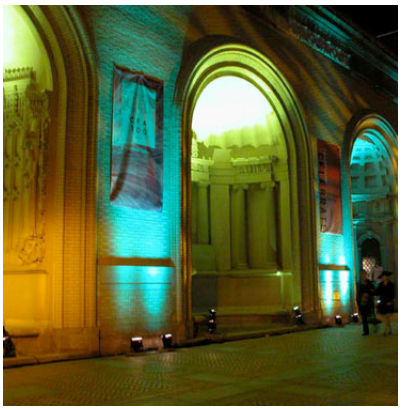
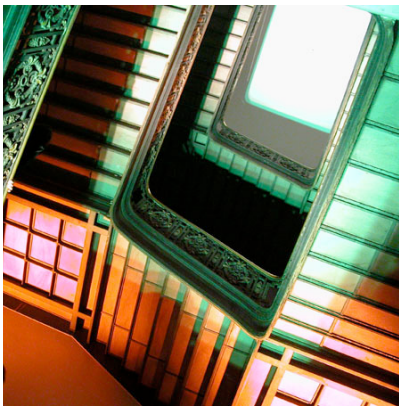
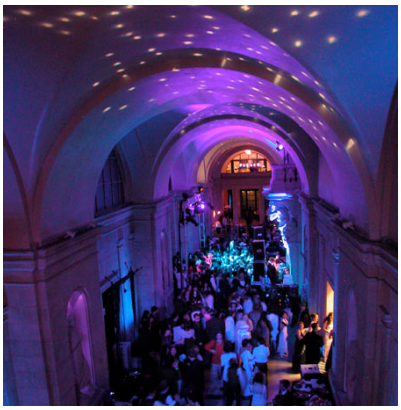


10.2 _ Collaborative Project Courses Hosted by the School of Architecture

School of Architecture Scene Design (with School of Drama)
For the third time, the School of Architecture led the design and construction of a full theater production: Romulus the Great, including costumes and masks for the actors.

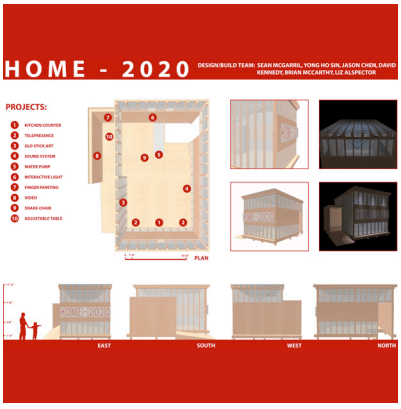


Beaux Arts Ball Lighting for CFA 100 Celebration (with School of Drama)
The concept for the lighting was to change the entire environment of CFA to another part of time or space at specific timed intervals. The themed environments were Jungle, Underwater, City, Cosmos and Sunrise.

Home 2020 : Studio X Carnival Booth (with multiple majors)
Carnegie Mellon's Spring Carnival was the launching pad for our home-of-the-future. Each year a major part of the spring festival is Booth, a competition where different campus organizations construct full-scale structures that house games and prizes for visitors to enjoy.



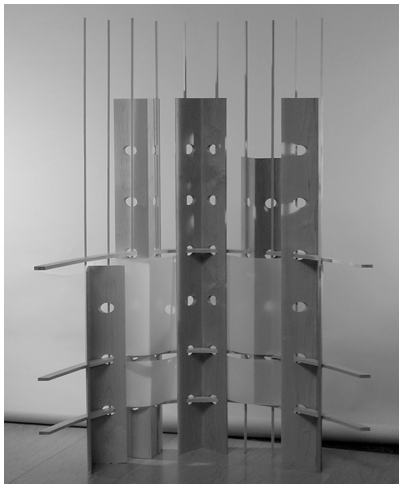


10.3 _ Foundation Sponsored Courses

2004 Enkeboll First Year Screen Project

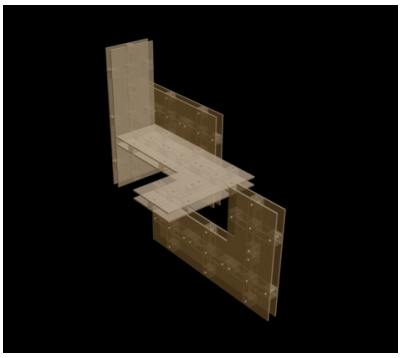
The Enkeboll Foundation for the Arts and Architecture, sponsored the first year studio project to design and build a full scale, all wood screens.

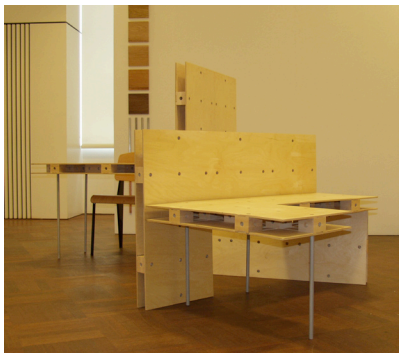




2005 Enkeboll Room in a Room

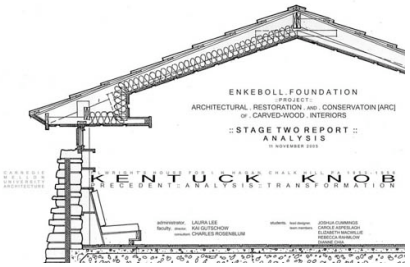
The work is a result of an interdisciplinary project between universities in the United States and in Belgium, wherein students of art, architecture, interior architecture, and industrial design collaborated on the design of components within a room which blur the boundary between furnishings and the room itself.

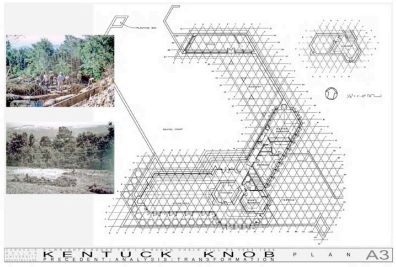


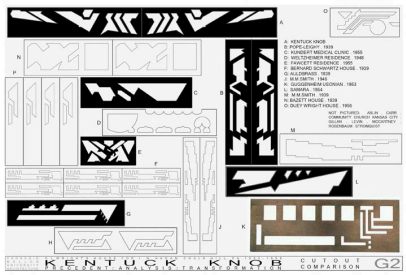


2006 Enkeboll Frank Lloyd Wright Study

We work in a systematic way from a deep understanding of history to the most cutting-edge design. The vehicle for this research was Frank Lloyd Wright's little-known, but amazingly innovative house designed and built for the ice-cream magnate I.N. Hagan in nearby Chalk Hill, Pennsylvania from 1953 to 1956.



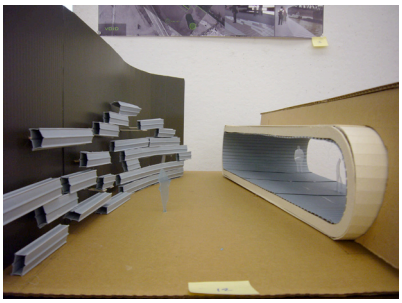
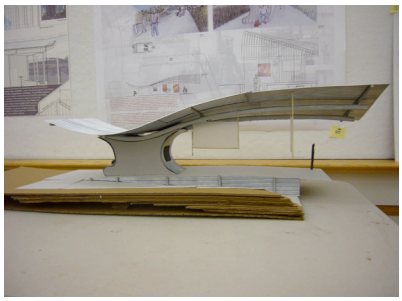
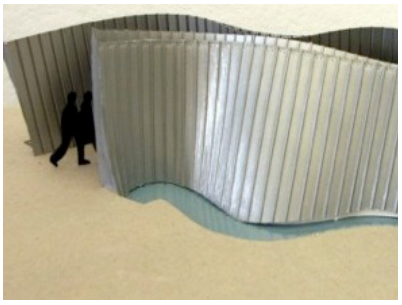
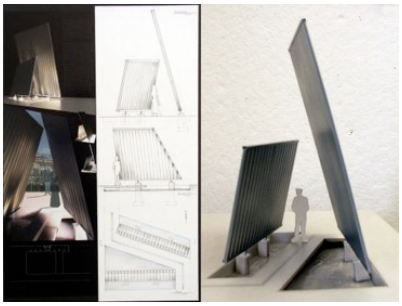




10.4 _ Industry Sponsored Competitions in Studio

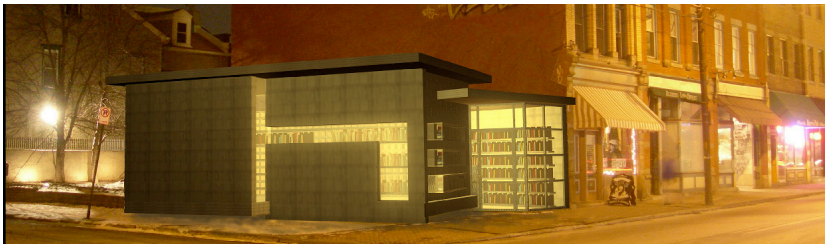
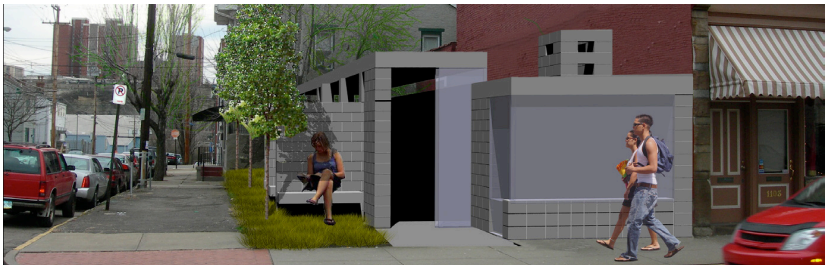
Epic Metals 2006, 2007

Epic Metals Corporation sponsors a one-week competition for Carnegie Mellon Architecture students to design an innovative structure utilizing Epic Metals Corporation roof or floor desk ceiling systems.


National Concrete Masonry Association

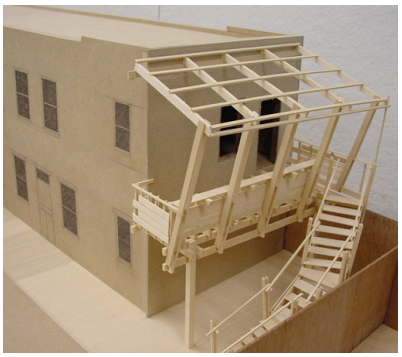
Every year, the Carnegie Mellon School of Architecture and the National Concrete Masonry Education and Research Foundation sponsor a design competition to promote creative use of concrete in architectural design.

10.5 _ Sponsored Design Build Courses

2004 Silver Eye Gallery

A core group of six students under the direction of Walter Boykowycz and Scott Smith designed and built a covered second floor deck with stairs and a patio below for the Silver Eye Center for Photography.



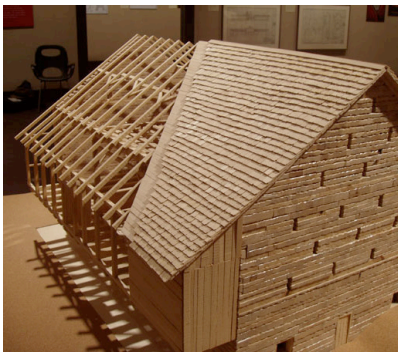
2005 Society for Contemporary Craft

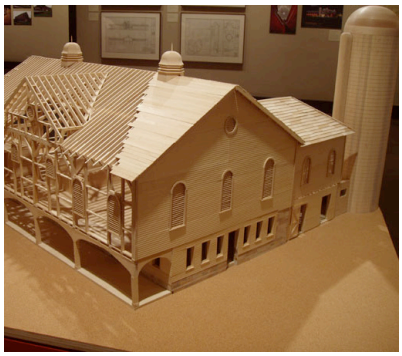
Four students under the direction of Scott Smith and Fifth Year Scholar Ashok Kanagasundram designed and built a unique storage system for the various tools of metalsmithing, a custom sink suited to the requirements of a metal studio which employs brazing and soldering as well as cold metal techniques.



2006 Barns Exhibit

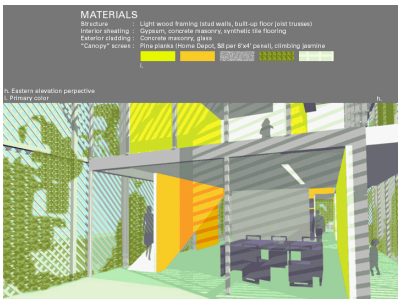
Six students under the direction of Scott Smith constructed two highly detailed hardwood models of barns in Western Pennsylvania for the Heinz Architectural Center of the Carnegie Museum of Art in Pittsburgh. These two barn models, along with two others made by a CMU Architecture alumnus (acting as an independent contractor) formed the core of the exhibition titled, Barns of Western Pennsylania, Vernacular to Spectacular.

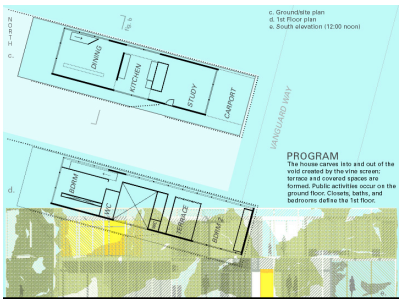


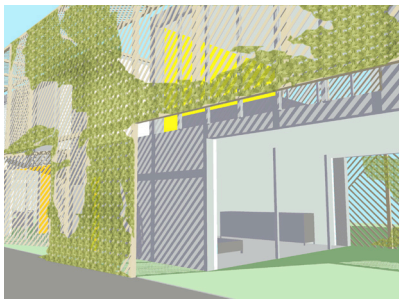


10.6 _ Competition Winners

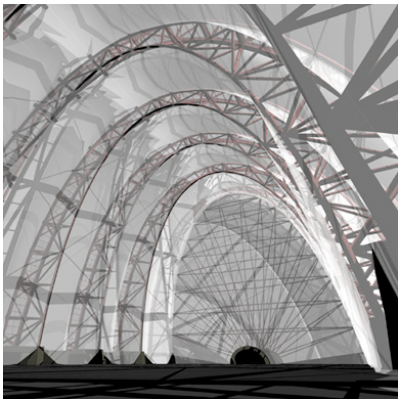
2006 Urban Reserve Competition First Place Gabe Cuellar, Third Year Student
This competition called to propose a house for the Urban Reserve development that embodied sustainability and contemporaneity. Architecture student Gabriel Cuéllar, at the time having just completed his sophomore year, developed a house and was awarded First Place, from over 60 entries.

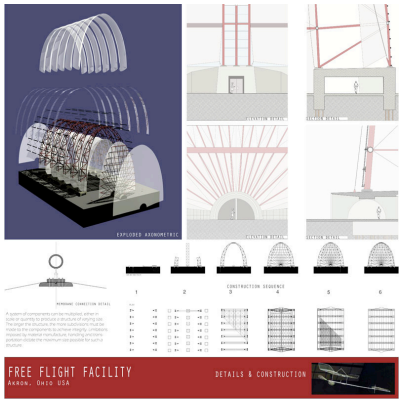






2006 ACSA / AISC Steel Competition Honorable Mention Ben Saks, Third Year Student
The aim of this project was to create a space suitable for flying indoor free flight model airplanes. The planes require a large open space clear of any vertical support. The air inside this space must be still, as the planes are very fragile.





2005 JP Morgan Chase Community Development Competition First Prize Renee Roy, Master of Urban Design Candidate
A team of eight students from five different Carnegie Mellon divisions submitted and presented "Centre Food: Bringing a Non-Profit Food Store to Pittsburgh's Hill District Neighborhood" as part of the 12th annual inter-scholastic JPMorgan Chase community development competition.

11.0 Alumni and Development

11.1 _ Alumni Data

Alumni _ Geographic Distribution for 2377 Total

PA	630	NH	22	IN	5	Taiwan	32	Greece	2
NY	296	AZ	17	NV	4	India	14	Kuwait	2
CA	206	VT	17	KY	4	Singapore	14	Indonesia	2
NJ	127	GA	16	IA	4	South Korea	13	Switzerland	2
MA	120	MI	15	LA	3	Turkey	11	Belgium	1
MD	90	WV	13	AK	3	Thailand	10	Denmark	1
FL	85	ME	12	AL	3	Hong Kong	9	Italy	1
VA	69	NM	11	WY	2	Canada	8	Poland	1
OH	66	SC	9	OK	2	UK	8	Portugal	1
CT	57	TN	8	UT	2	England	4	Spain	1
DC	42	DE	8	GU	2	Netherlands	4	Sweden	1
IL	42	RI	7	MT	2	Japan	4	Bermuda	1
NC	38	MN	7	MS	2	Austria	4	Egypt	1
WA	33	MO	7	KS	2	China	3	Iran	1
CO	29	WI	6	VI	1	Germany	2	Costa Rica	1
TX	29	PR	6	ID	1	France	2	Mexico	1
OR	24	HI	5	AR	1	Australia	2	Nigeria	1

Alumni Receptions

2004/5		
Boston	46 attended in November 04	hosted by Elliott Rothman, Rothman Partners
New York	94 attended in February 05	hosted by Adam Farmerie | Greg Bradshaw @ Public
Pittsburgh	30 attended in April 05	in conjunction with Spring Carnival
2005/6		
Chicago	36 attended in May 05	hosted and sponsored by the Al-Chalabi's
San Francisco	32 attended in May 05	hosted by Dan Garber
Las Vegas	40 attended in June 05	in conjunction with the AIA convention
New York	90 attended in March 06	hosted and sponsored by Adam Farmerie | Greg Bradshaw @ Public
Pittsburgh	30 attended in April 06	in conjunction with Spring Carnival
2006/7		
Los Angeles	50 attended in June 06	in conjunction with the AIA convention
Boston	28 attended in March 07	hosted by D.Madson / A. LeBuffe CBT Architects
Pittsburgh	30 attended in April 07	in conjunction with Spring Carnival
San Antonio	47 attended in May 07	in conjunction with the AIA convention
Washington, DC	32 attended in October 07	in conjunction with the Solar Decathlon

Homecoming Activities and Alumni Awards

Since the last Advisory Board Visit, the following alumni have received recognition awards:

Harris, Oscar	1971	Turner Associates	2002 Alumni Achievement Award
Caste, Lucian	1950	Caste Architects & Engineers	2002 Distinguished Service Award
Fisher, John	1958, 1961	John S. Fisher, AIA	2005 Distinguished Service Award
Gindroz, Ray	1963, 1965	Urban Design Associates	2006 Alumni Achievement Award
Sarko, Mellssa	2005	Polskek and Partners	2006 Young Alumni Acheivement Award

Alumni Annual Appeal and Newsletter

Beginning in 2005, the School prepares a 2-page news summary of the news and accomplishments of the School of Architecture community. We make direct appeal for projects that directly impact and enhance the students' academic experience. The result has been an increase of annual giving as follows:

2004	$40,000
2005	$54,000
2006	$58,000
2007	$64,000

11.2 _ College of Fine Arts and School of Architecture Development

College of Fine Arts Commitment Totals by Year and Group
10/2/2007

	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Annual Fund Gifts	$457,545	$315,984	$486,285	$436,578	$489,319	$400,911	$362,398	$551,914	$44,089	**$3,545,022**
Corporations	$1,689,975	$190,692	$328,035	$255,710	$226,507	$465,036	$255,551	$688,820	$10,950	**$4,111,275**
Foundations	$1,149,339	$390,022	$725,116	$840,852	$740,639	$430,347	$464,736	$1,180,842	$85,196	**$6,007,087**
Individual Gifts	$2,593,522	$300,961	$784,325	$705,945	$1,558,043	$7,641,526	$2,144,932	$50,528	$100,346	**$15,880,128**
Life Income Plans	$330,765	$106,015	$206,015	$262,848	$45,000	$58,000	$0	$25,000	$0	**$1,033,643**
Realized Bequests	$1,734,183	$11,760,439	$586,570	$137,077	$1,768,877	$896,858	$41,767	$217,017	$1,000	**$17,143,789**
TOTAL	**$7,955,328**	**$13,064,112**	**$3,116,346**	**$2,639,009**	**$4,828,385**	**$9,892,677**	**$3,269,384**	**$2,714,121**	**$241,580**	**$47,720,943**

College of Fine Arts Cash Totals by Year and Group
9/28/2007

	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Annual Fund Gifts	$417,604	$405,546	$499,488	$460,392	$478,946	$437,559	$378,488	$534,303	$41,732	**$3,654,057**
Corporations	$1,744,975	$681,192	$281,535	$301,710	$184,007	$649,786	$536,551	$968,320	$13,450	**$5,361,525**
Foundations	$1,409,339	$610,022	$821,116	$672,252	$623,239	$750,347	$494,071	$676,211	$475,629	**$6,532,224**
Individual Gifts	$3,602,600	$853,043	$1,830,509	$754,945	$534,325	$2,013,174	$2,802,500	$441,573	$1,355,466	**$14,188,135**
Life Income Plans	$330,765	$106,015	$206,015	$262,848	$45,000	$58,000	$0	$25,000	$0	**$1,033,643**
Realized Bequests	$16,734,183	$11,760,439	$586,570	$137,077	$1,768,877	$896,858	$41,767	$456,017	$1,000	**$32,382,789**
TOTAL	**$24,239,466**	**$14,416,257**	**$4,225,234**	**$2,589,223**	**$3,634,393**	**$4,805,723**	**$4,253,378**	**$3,101,424**	**$1,887,276**	**$63,152,373**

School of Architecture Commitment Totals by Year and Group
10/2/2007

	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Annual Fund Gifts	$54,127	$49,886	$26,469	$71,192	$69,672	$80,446	$86,332	$114,424	$4,940	**$557,486**
Corporations	$11,000	$84,820	$87,450	$110,723	$53,630	$297,366	$52,975	$210,305	$2,400	**$910,669**
Foundations	$45,000	$12,059	$50,000	$73,000	$139,479	$176,500	$103,500	$30,000	$0	**$629,538**
Individual Gifts	$72,213	$109,214	$642,600	$519,616	$290,600	$1,939,764	$142,744	$0	$0	**$3,716,750**
Life Income Plans	$37,153	$0	$0	$90,000	$20,000	$25,000	$0	$0	$0	**$172,153**
Realized Bequests	$1,000	$0	$100,000	$0	$0	$0	$0	$0	$0	**$101,000**
TOTAL	**$220,492**	**$255,979**	**$906,519**	**$864,531**	**$573,380**	**$2,519,076**	**$385,550**	**$354,729**	**$7,340**	**$6,087,596**

School of Architecture Cash Totals by Year and Group for Architecture
9/28/2007

	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Annual Fund Gifts	$54,587	$50,871	$33,334	$77,032	$72,472	$78,096	$93,192	$101,028	$5,615	**$566,227**
Corporations	$6,000	$75,320	$55,950	$111,723	$62,630	$308,616	$52,975	$201,305	$2,400	**$876,919**
Foundations	$45,000	$12,059	$0	$123,000	$139,479	$176,500	$103,500	$20,000	$0	**$619,538**
Individual Gifts	$100,075	$137,505	$652,796	$519,616	$50,600	$671,764	$185,744	$114,000	$0	**$2,432,099**
Life Income Plans	$37,153	$0	$0	$90,000	$20,000	$25,000	$0	$0	$0	**$172,153**
Realized Bequests	$1,000	$0	$100,000	$0	$0	$0	$0	$239,000	$0	**$340,000**
TOTAL	**$243,815**	**$275,756**	**$842,080**	**$921,371**	**$345,180**	**$1,259,976**	**$435,411**	**$675,333**	**$8,015**	**$5,006,936**

11.3 _ Endowments

HISTORICAL (pre 2004)	Endowment	Annual Yield	
Undergraduate Student Awards			
Stewart L. Brown Memorial Scholarship	$150,000	$7,700	
Robert H. Burdett Assistantship	$100,000	$5,300	
Jan P. Junge A'71 Memorial Scholarship	$40,000	$2,000	
Luther S. Lashmit Undergraduate Award in Architecture	$100,000	$5,200	
John Knox Shear Traveling Scholarship	$200,000	$10,500	
Louis F. Valentour A'49 Traveling Scholarship	$180,000	$8,000	
Graduate Student Awards			
The Akram Midani Graduate Fellowship Fund	$20,000	$1,000	
Lecture Series			
William Finglass I, 1933 Lecture Series Fund	$50,000	$2,800	
Vetter Memorial Lecture Fund	$25,000	$1,250	
Urban Design Associates David Lewis Lecture Fund		$5,000	
For Faculty			
T. David Fitzgibbon Professorship	$850,000	$44,500	
Andrew W. Mellon Professorship	$120,000	$11,000	
	$1,835,000	$104,250	
NEW (since 2004)	Endowment	Annual	
Undergraduate Student Awards			
Lewis J. Altenhof Memorial Scholarship	$145,000	$7,300	
JR Clancy Theater Architecture Program	$100,000	$5,000	
Cornerstones Scholarship Award	$52,000	$3,000	
Gindroz Arch/Music Prize for Study/Travel in Europe	$100,000	$5,000	
Lou Valentour Traveling Scholarship (addition)	$50,000	$2,500	
Graduate Student Awards			
George W. Anderson, Jr. Memorial Fund	$85,000	$3,500	
Lecture Series			
Watson Distinguished Lecture Series (housed in CFA)	$500,000	$25,000	
For Faculty			
Lucian and Rita Caste Professorship (complete in 2009)	$1,000,000	$50,000	
Caste Library Fund for Urban Design	$50,000	$2,500	
Ferguson / Jacobs Classical Architecture Prize	$50,000	$5,000	
Alumni			
Delbert Highlands Travel Fellowship	$88,000	$3,500	
Head's Discretionary			
Licegna Fund (endowed in 2009)	$50,000		
	$2,270,000	$112,300	
Alumni Giving Average		$60,000	
TOTAL ENDOWMENT	**$4,105,000**	**$276,550**	
Annual Awards			
Auerbach Associates for Theatre Architecture		$5,000	
CH2MHill Foundation College Contributions Award		$3,500	
Concrete Masonry Association Competition		$6,500	
Epic Metals Competition, Lecture, Reception		$6,500	
IBACOS Graduate Student Scholarship Support		$19,000	
Richard Gensert Structures Award		$3,500	
Velux Competition		$10,000	
Undergraduate Internships			
Lubetz / Myers		$4,000	
Perkins Eastman		$3,500	
		$61,500	
TOTAL Annual Awards: Endowments and Alumni Giving			**$338,050**

11.4 _ Alumni 100

Alumni Achievement Awards

Auerbach	Leonard	1966, 1967	Auerbach Associates	Alumni Achievement Award - 2000	San Francisco, CA	
Carter	Don	1967	Urban Design Associates	Alumni Achievement Award - 2001	Pittsburgh, PA	FAIA
Caste	Lucian	1950	Lucian Caste Architects & Engineers	Distinguished Service Award - 2002	Pittsburgh, PA	
Fisher	John	1958, 1961	John S. Fisher, AIA	Distinguished Service Award - 2005	Tarzana, CA	
Fleishman	Dick	1952	Fleischman & Partners Architects	Alumni Achievement Award - 1980	Cleveland, OH	
Gindroz	Ray	1963, 1965	Urban Design Associates	Alumni Achievement Award - 2006	Pittsburgh, PA	FAIA
Harris, Jr.	Oscar	1971	Turner Associates	Alumni Achievement Award - 2002	Atlanta, GA	FAIA
Sarko	Mellssa	2005	Polskek and Partners	Young Alumni Acheivement Award	New York, NY	

National Leadership and Recognition

Damianos	Sylvester	1957	AIA National President	Chancellor, College of Fellows	Pittsburgh, PA	FAIA
Lawler	Jim	1966	AIA National President	Chancellor, College of Fellows	West Hartford, CT	FAIA
Steidl	Doug	1971	AIA National President		Ohio	FAIA
Caruso	Andrew	2006	AIAS National President		Washington, DC	
Fabbroni	Larry	2001	AIAS National President		New York, NY	
Kunselman	Dave	1990	AIAS National President			
Bojsza	Kate	2003	AIAS National Vice President		New York, NY	
Malecki	Christine		AIAS National Vice President			
Rosenblatt	Arthur			AIA Jefferson Medal	New York, NY	

FAIA (and others listed above and below)

Thomas	Joe	1938			Los Angeles	FAIA
Heuer	Charles	1971				FAIA
Knoop	Stuart	1956	Oudens and Knoop	Vice President/Co-Founder	Chevy Chase, MD	FAIA
Liff	Bernard	1935			Pittsburgh, PA	FAIA
Lynch	Dale				Pittsburgh, PA	FAIA
Palermo	Gregory	1969	Iowa State University	Professor	Ames, IO	FAIA
Gary	Bowden	1967	RTKL	Senior Vice President	Baltimore, MD	FAIA

Design Practice Leadership

Aferiat	Paul	1975	Stamberg Aferiat Architecture	Principal	New York, NY	
Boley, III	William	1989	Add Inc.	Senior Associate Principal	Cambridge, MA	
Burt	Ralph		Burt Hill	Principal	Pittsburgh, PA	
De Young	Richard	1973	WTW Architects	President & CEO	Pittsburgh, PA	
Duffy, Jr.	Roger	1979	SOM	Design Principal	Chicago, IL	FAIA
Ferguson	Mark	1977	Ferguson Shamamian Architects	Principal	New York, NY	
Jacob, III	Paul	1971	RTKL	Chairman of Board of Directors	Los Angeles, CA	
Jackson	Jon		Bohlin Cywinski Jackson	Principal	Pittsburgh, PA	
Kittredge	Neil	1993	Beyer Blinder Belle	Director of Urban Design	New York, NY	
Marsh, Jr.	George	1979	Payette Associates Inc.	Principal	Boston, MA	
Moore	Bruce	1985	Gensler - New York	Senior Vice President	New York, NY	
Payton	Neal	1978	Torti Gallas and Partners	Principal	Los Angeles, CA	
Rothman	Elliot	1958	Anshen + Allen + Rothman	Director	Boston, MA	
Winkler	William	1968	Sasaki			
Zoelly	Pierre					

More Recent Gradautes in Recognized Practices

Buck	Brent	2003	Todd Williams Billie Tsien		New York, NY
Devarajin	Anand	1998	Frank Ghery		Los Angeles, CA
Duston-Muno	Paul	2003	Cesar Pelli		New York, NY
Farmerie	Adam	1996	Avro|KO		New York, NY
Garvin	Chris	1995	Croxton Collborative Architects		New York, NY
Kaps	Josef	1995	Sir Norman Foster & Partners		London, UK
Kim	Thomas	1995	Frank Ghery		Los Angeles, CA
Korian	Peter	1994	Iomedia		New York, NY
Lin	Dillon	1998	Zada Hadid		London, UK

Miller	Paul	1998	Konig Eisenberg		Santa Monica, CA
Oki	Toshi	1996	SANAA		Japan
Song	Steven	2006	Arquitectonica		New York, NY
Yoo	Byundon	2000	Studio Daniel Liebeskind		New York, NY

Women Graduates in Recognized Positions

Apelian	Lara	2001	Robert Stern		
Biagioli	Kimberly	1987	Biagioli Design Architecture	Principal	New Jersey
Dowling, Col.	Maria	1987	U.S. Air Force, Nellis AFB	Colonel	Las Vegas, NV
El-Chalabi	Margery				Chicago, IL
Ha	Yen	1996	Front Studio	Principal	New York, NY
Kalla	Ann		Cocognani Kalla	Partner	New York, NY
Kavchak	Leslie	1993	Smith Architectural	Associate	Palm Beach, FL
Kim	Sooran	2004	KPF		New York
Levin	Brenda	1967	Levin and Associates	Principal	Los Angeles, CA
Loysen	Karen	1978	Loysen and Associates	Partner	Pittsburgh, PA
Lubenau	Anne-Marie	1989	Community Design Center of Pittsburgh	Executive Director	Pittsburgh, PA
Nakano	Stacy	1995	Michael Maltzan	Associate	Los Angeles, CA
Stoler	Suzette	1987	Gensler - New York		New York, NY
Strong	Heather	1993	Valerio Dewalt Train		Chicago, IL
Wight	Suzanna	1999	AIA	Emerging Professionals Director	Washington, DC
Yamada	Yumiko	1999	OMA	Project Manager	Rotterdam, Holland
Yanagishita	Michi	1996	Front Studio	Principal	New York, NY

Alumni in Recogized Positions

Aragon	Mark	1997	White House Communications Agency	Presidential Communications Officer	Washington, DC
Berreneche	Raul			Journalst and Writer	New York, NY
Biagioli	Alexander	1988	Smith Barney	Vice President	New York, NY
Carter	Jon	1979	Ward Leonard Electric Company Inc.	President	Thomaston, CT
Chalupa	Klaus	1992	Blackline Construction	President	San Francisco
Cheng	Edmund	1980	Wing Tai Holdings - Singapore	Deputy Chairman	Singapore
Fortune	Roger	1987	NYC Economic Development Corp.	Assistant Vice President	New York, NY
Kaskey	Raymond	1967	Kaskey Studio	Sculptor	Washington, D.C.
Luczkow	Kevin	1996	New England Patriots	Construction Administration Manager	Foxborough, MA
Matthew	Paul	1990, 1996	Lawrence Berkelry Labs		Berkeley, CA
Niehaus	Peter		Siemens	Director of Design	Germany
Pak	Eddie	1996	Ogilvy & Mather	Designer	New York, NY
Pontius	Ronald	1979	Commonwealth of Pennsylvania	Supervisor - Architectural Design Divis	Harrisburg, PA
Robert	Bergson	1988	Northern Trust Investments, Inc.	Vice President	Chicago, IL
Suna	Stuart	1981	Silvercup Studios	President	Long Island City, NY
Tinkler	Mark	1996	Thinkmap	CTO	New York, NY
Tomashoff	Seymour	1950	CBS TV	Art Director	Los Angeles, CA
Yessios	Christos	1973	Auto. Des. Sys., Inc.	President & CEO	Columbus, OH

Alumni in Academia

Chan	Chiu Shui	1990	Iowa State University		Ames, IA
Cote	Pierre	1991	Laval University		
Crisman	Phoebe	1984	University of Virginia	Associate Professor	Charlottesville, VA
Kalay	Yehuda	1983	University of California, Berkeley	Professor of Architecture	Berkeley
Menefee III	Charles	1959	University of Virginia	Associate Professor	
Millas	Aristides	1958	University of Miami	Associate Professor of Design and His	Miami
Pohlman	Richard	1971	University of Florida	Associate Professor of Architecture	
Saggio	Nino		Rome La Sapienza	Professor	Rome, Italy
Stouffs	Rudi	1994	TU Delft		Delft Netherlands
Takahashi	Lois	1988	University of California	Associate Professor of Urban Planning	Los Angeles
Temkin	Aaron	1992	Florida Atlantic University	Assistant Professor	
Weisman	Gerald	1969	University of Wisconsin	Professor of Architecture	Milwaukee, WI
Willis	Dan	1979	Penn State University	Head of Department of Architecture	State College, PA

12.0 Resources

12.1 _ Financial Overview

College of Fine Arts Base Allocation

Fiscal Year (in Millions)	
FY 01	14.033
FY 02	14.518
FY 03	14.965
FY 04	15.708
FY 05	16.285
FY 06*	15.939
FY 07	16.567
FY 08	17.371
% Increase	23.79%

**decrease caused by change in calculation of graduate tuition return*

Budget for Schools Units in College of Arts (in millions

School or Unit	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06*	FY 07	FY 08	% increase
Architecture	2.655	2.722	2.789	2.916	3.022	2.881	2.978	3.099	16.72%
Art	2.152	2.202	2.281	2.388	2.48	2.515	2.763	2.866	33.18%
Design	1.923	1.946	1.997	2.084	2.166	1.991	2.017	2.128	10.66%
Drama	3.127	3.208	3.308	3.471	3.597	3.368	3.433	3.552	13.59%
Music	3.241	3.382	3.498	3.683	3.83	3.952	4.07	4.367	34.74%
CFA Office of the Dean	0.795	0.898	0.928	0.975	1.011	1.003	1.053	1.097	37.99%
Regina Miller Gallery	0.065	0.068	0.071	0.094	0.098	0.1487	0.1502	0.1547	138.00%
Studio for Creative Inquiry	0.086	0.09	0.093	0.097	0.1	0.1024	0.1036	0.107	24.42%

**decrease caused by change in calculation of graduate tuition return*

Budget Statistics for Fall 2007

School	FY 08 Budget	# Students	Expense per student
Architecture	$3,098,570	332	$9,333
Art	$2,865,710	184	$15,575
Design	$2,128,468	212	$10,040
Drama	$3,551,817	253	$14,039
Music	$4,367,241	234	$18,663

School of Architecture Budget: Fiscal Year 2007

INCOME		$3,354,800	
Base Allocation	$2,978,272		
Graduate Program	$270,000		
Alumni Giving	$68,400		
Pre-College	$38,128		
EXPENSES			
Salaries / Benefits		$2,749,106	81.95%
Tenure / Tenure Track	$1,396,746		
Adjunct	$509,818		
Staff	$419,672		
Special / Teaching	$305,419		
Student Employees	$67,464		
Non-teaching / Special Projects	$38,652		
CFA Contribution to Faculty and Staff	$8,110		
Guests, Models, External TA's	$3,225		

Faculty and Student Support		$79,197	2.36%
Faculty GM Accounts	$46,197		
Studio GM Accounts	$22,500		
Additional Studio Travel Support	$10,500		
Programs / Special Projects and Needs		$64,250	1.92%
AIAS / I AM	$3,500		
Andrew Mellon Professorship	$11,000		
Architecture Explorations Support	$5,000		
Architecture Theater Program	$10,000		
Carnival Booth	$1,200		
Faculty Search + Relocation Expense	$11,800		
Fifth Year Show	$2,500		
Grad Student Travel	$3,500		
IW Security System	$2,250		
Larry Hayhurst Digi Fab Lab Expenses	$2,000		
Solar Decathlon	$8,000		
Summer Internship for Diversity	$3,500		
Digital Fabrication Lab: Design, Equipment, Space		$31,128	0.93%
Computing: Hardware & Software		$149,671	4.46%
Operating		$281,448	8.39%
Communications: External Printing, Postage, Mailing	$11,500		
Communications: Phone	$19,600		
Equipment	$13,948		
Entertainment, Travel, Alumni Relations	$32,500		
Events and Meetings	$5,000		
Facilities Maintenance	$19,900		
Facilities Renovation / Furniture	$71,800		
Operational Expenses	$7,800		
Lecture Series	$25,000		
Internal Printing & Paper	$17,000		
Memberships	$8,800		
Student Tuition – Glass Center	$2,800		
Supplies: Office & Misc.	$4,300		
Miscellaneous Expenses	$10,800		
Scholarships	$7,100		
Woodshop + Technical Supplies	$23,600		

12.2 _ Facilities

Increase of Total Space in Square Footage by College

Carnegie Mellon College	Jun-94	Jun-03	Jun-06	% Increase from '94
College of Fine Arts	186,569	249,378	282,484	51%
Carnegie Institute of Technology	241,090	306,161	313,937	30%
Humanities and Social Sciences	87,804	121,436	138,735	58%
Mellon College of Science	233,755	296,959	306,426	31%
School of Computer Science	143,252	276,301	295,307	106%
Graduate School of Industrial Administration	65,129	87,699	85,486	31%
Heinz School of Public Policy and Management	26,813	47,332	49,882	86%

College of Fine Arts Space Statistics Comparison (as of June 2007)

School or Unit	Square Footage	# Students	Sq. Foot / Student
Architecture	52,915	325	162.8
Art	54,418	164	331.8
Design	30,045	205	146.6
Drama	75,049	243	308.8
Music	40,983	218	188.0
CFA Office of the Dean	9,944	6	n/a
Regina Gouger Miller Gallery	7,704	0	n/a
Studio for Creative Inquiry	2,768	0	n/a
Total:	273,826	1,161	235.8

School of Architecture Use of Space

Usage	Square Footage	Percentage
Studios	17,650	35.2%
Conference / Crit	9,679	19.3%
Woodshop	4,231	8.4%
Computer Labs	4,200	8.4%
Faculty Offices	3,741	7.5%
Service	3,409	6.8%
Graduate Students	2,585	5.2%
Staff	2,306	4.6%
Digital Fabrication Lab	1,740	3.5%
Solar Decathlon House	594	1.2%
Total:	50,135	100%

12.3 _ Computing Hardware / Software and Equipment

School of Architecture Hardware Inventory

	# Persons	PC	Mac	Ratio
Full Time Faculty (includes virtual machines)	17	21	11	1.9 : 1 FT faculty
Part Time Faculty	40	1	2	1.0 : 13.3 PT faculty
Staff (includes virtual machines)	14	11	6	1.2 : 1 FT staff
Computing Department (includes servers)	2	7	1	4.0 : 1 FT staff
Students (undergraduate)	259	64	1	1.0 : 4 students
Students: personal ownership (survey 3/07)	259	163	55	1.0 :1.08 students

Peripherals

B/W Laser Printers	7
Personal Laserjet or Inkjet	8
Color Laser Printers	2
Inkjet Printers	2
Slide Scanners	2
Flatbed Scanners	10
Plotters	3
Digital Cameras	2
Data Projectors	4
Slide Projectors	4
Copiers	2
Fax	3

Company	Software Name	Licenses
Adobe	Acrobat Pro	40
Adobe	Designer	40
Adobe	Distiller	40
Adobe	Dreamweaver	40
Adobe	Flash	40
Adobe	Golive	40
Adobe	Illustrator	40
Adobe	Imageready	40
Adobe	InDeisgn	40
Adobe	Photoshop	40
Adobe	CS3 Design	40
Ahead	Nero	100
Apple	itunes	75
Apple	quicktime	75
Archibus	FM	75
Autodesk	3ds Max	40
Autodesk	Arch Desktop	50
Autodesk	Lightscape	75
Autodesk	Maya	40
Autodesk	Revit	50
Bose	Modeler	6

CMU	kerberos	75
CMU	secure Shell	75
DesignBuilder	DesignBuilder	License
DOE	equest	75
Eclipse	Eclipse SDK	75
Ecotect	Ecotect	License
ESRI	ARCGIS	75
Flamingo	Flamingo	License
GARD Analytics	Energy Plus	75
Google	sketchup	35
Java	JavaSDK	75
Metroworks	codewarrior	75
Microsoft	Office	75
Mozilla	Firefox	75
Nurbs	Rhino3d	2
Python	Python	75
Rarlabs	winrar	75 Demo
Rational	Requisite	-
Rational	Rose	-
Sassafras	Keyserver	License
SBIC	Energy10	75
Stage3 / CMU	Alice3d	75

12.4 _ Digital Fabrication Lab

2D Subtractive

Epilog Laser Cutter 24" x 36" incl. workstation	$35,000
Purex HEPA, Chemical and Dust Filtration System for laser cutter	$ 6,500

3D Subtractive

CNT Motion 3-axis CNC Router 4' x 8' x 11"	$48,000
Dust Collector	$ 1,000
Air Compressor	$ 500

3D Additive

Dimension 3d printer (abs plastic) – build volume of 8"x8"x12"	$30,000
Z-Corp 3d printer (plaster) – build volume of 8"x8"x10"	$35,000

3D Deformation

Formech Vacuum Former 24" x 24"	$10,000

General Lab Support

Exterior Jib Crane for vertical material loading	$ 5,000
Machine Specific Construction	$ 5,000
Shipping / Installation	$ 4,000
Workstation furniture / Material Library	$10,000
CAD/CAM Workstations and software (4)	$10,000

Total Cost **$200,000**

12.5 _ Metal and Woodshop

The School maintains a shop in the basement of the College of Fine Arts. It is specifically for the use of architecture students and faculty for class and School-related projects. With direct financial support from the **Dean**, Hilary Robinson, the woodshop has expanded its space by 900 square feet, upgraded existing and purchased new machinery, and expanded its material capabilities beyond wood. A metals shop was added in 2005. The total upgrade since 2005 totals **$42,356.21.**

	Qnty	Machine Cost	Shipping	Sub-total
Saw Stop table saw	2	$2,799.00	$600.00	$6,198.00
table saw accessories	1	$1,527.00		$1,527.00
saw stop extension table	1	$150.00		$150.00
Metaba KGS 305 Dual bevel SlidingMiter Saw	1	$681.25		$681.25
Lauguna 16" band saw	1	$1,750.00	$256.00	$2,006.00
Walled canopy for dust containment	1	$369.17		$369.17
plugs and lights for walled canopy	1	$40.25		$40.25
3 ph plugs and cord for new machines	1	$138.24		$138.24
Powermatic wood lathe	1	$3,200.00	$250.00	$3,450.00
Extrema 20" planer	1	$3,699.00	$250.00	$3,949.00
Powermatic dual drum sander	1	$2,799.00	$250.00	$3,049.00
Saw Systems panel saw	1	$1,695.00	$162.00	$1,857.00
Accessories for panel saw	1	$558.00		$558.00
Invicta slot mortiser	1	$3,040.00	$177.78	$3,217.78
wire for new slot mortiser	1	$19.95		$19.95
Floor model with rolling wheels and anvil wheels	1	$2,465.25	$200.00	$2,665.25
additional anvils	2	$80.75		$161.50
Non-wood working equipment				
Foot shear, 37"x16ga	1	$1,432.00		$1,432.00
Box and pan brake, 48"	1	$1,362.20	$268.00	$1,630.20
weld on leg kit for box/pan brake	1	$110.00		$110.00
Slip roller, 50"x 16ga	1	$683.45	$139.00	$822.45
brake stand for slip roll	1	$142.95		$142.95
Punch	1	$1,479.00	$159.10	$1,638.10
Horizontal band saw	1	$918.00		$918.00
support stands for hrz bnd sw	1	$154.98		$154.98
3/4" tubing bender	1	$147.25	$12.11	$159.36
Low plate brake	1	$199.50	$15.55	$215.05
Nibbler	1	$230.00		$230.00
Magnabend sheet metal bending machine	1	$2,375.00	$175.00	$2,550.00
Lathe accessories				
bowl gouge (included below)	1	$0.00		$0.00
miscel accessories, Woodcraft	1	$125.97		$125.97
curved tool rest	1	$39.95		$39.95
4" double ended caliper	1	$13.99		$13.99
curved undercut scraper	1	$51.99		$51.99
5/8" swan neck hollowing tool	1	$59.99		$59.99
7" double ended caliper	1	$13.99		$13.99
Vm 120 1-1/4 x 8 chuck	1	$269.00		$269.00
Vm bowl jaws	1	$94.95		$94.95
Vm adapter 1 to 1-1/4	1	$29.95		$29.95
3/16 diamond shaped parting tool	1	$39.95		$39.95
Other				
Mark X vacuum pump with controls	1	$985.00		$985.00
54x60x 20 mil polyurethane vacuum bag	1	$197.00		$197.00
54x109x30 mil polyurethane vacuum bag	1	$394.00		$394.00
TOTAL				**$42,356.21**