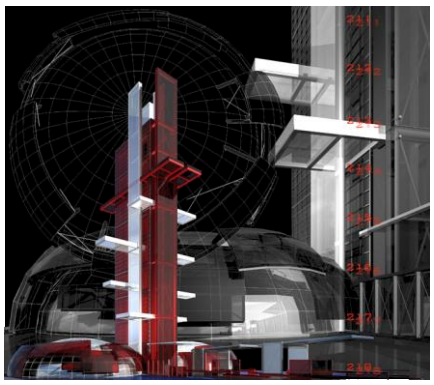
FORM - SPACE EDUCATION IN THE NEW MILLENNIUM



TO

ARCHITECTURAL EDUCATION FOR THE NEW MILLENNIUM CONFERENCE
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BY

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"We no longer need imagine if education will survive in the 21st century. By now, it is fact: that the emerging technology - for the most part, consisting of information, digital, and telecommunications technologies - is the most important force we must consort with in architecture education in the near future." *John Lennon 1998*

Introduction:

The critical moment for a student is the first day of study at the architectural school, the time when the mind is open and receptive to new ideas, before stagnation and ossification sets in. Get to their minds first before anyone else. Encourage the students to develop their creative imaginations and sensitivities.

For the first project, it works best to "design yourself a dream house. Make it as fanciful as you please or a box if you wish, just so long as it is a good box."

In discussing a design project with a student, the instructor must always be careful to avoid interfering with the student's creative processes. At no time should a student be given a recommendation to go to the library or to some existing building to study how others had resolved a similar problem. The student should never be told what to do or shown how to do it. The project is to be the student's own in every respect, and when completed, the student can well be proud of what he has accomplished. During the discussions, the instructor might ask questions to stimulate thinking about various aspects of the project. "Why was this done?" or "How did you arrive at this result?"

The processes of questioning by the student of "why" and "how" leads to the most important development the student's ability to critically examine his own work as well as the work of others. His abilities in self-evaluation gives him a sense of responsibility and self-esteem.

Each student will strive to excel in his work, not in the sense of competitiveness but for the pure joy in doing beautiful work.

In conversations with great, visiting architects, the students develop an enjoyment in the ideas being expressed and an appreciation of the great beauties possible in the application of those ideas. In gaining this level of understanding of their art, the students are in a position to create outstanding works of architecture.

Soon after entering architectural studies, the students must be exposed to the philosophical basis of organic architecture to develop a better understanding, appreciation and love of their art.

Innovative teaching methods must be developed to cover the ground and to keep the student's interest and excitement at a high pitch.

The problem of covering such a vast amount and variety of material in such a short time turned out to be a blessing; the students were never bored with long and tedious assignments.

Does the computer education received by today's architecture students provide them with the skills sought by employers?

Architects and educators have long disagreed about which skills should be taught in architecture schools and which, if any, are best taught later, during apprenticeships.

Many professors emphasize design and theory, believing that the more practical skills are better taught in a professional context. Many fear that offering more skills-oriented training would turn the professional institutions into vocational schools.

Meanwhile, practitioners frequently complain that recent graduates come to them unprepared for real work. This disagreement continues in the age of the computer. Schools increasingly focus technology on design applications, and firms grumble when young graduates can't do computer drafting.

Yet some interns are entering firms with a computer-aided design (CAD) skills that far outstrip those of their employers. Technology has been adopted in some architecture schools in ways so radical that the curriculum is being transformed.

Architecture today:

The education of an architect, is a complex process that encourages students to develop new ways of seeing, thinking and doing in order to become capable and quality-assured designers of the built environment.

Most architecture students enter higher education with little experience of architecture as a discipline, and therefore a large part of architectural education is concerned with the development of new cognitive abilities, values and conceptions.

Architectural education is almost universally project based, with the majority of activity centered on the design studio. By its nature, architectural education is rich, varied and interdisciplinary.

The discourse on architectural education is dominated by tensions between the need to provide students with a broad liberal education and the vocational need to prepare students well for a professional career.

Much of the current debate centers around a perceived "Curriculum Creep" of additional professional requirements being added to an already cramped syllabus.

However, in the age of technology to focus the debate about the computer's role on skills versus ideas ignores the fact that computers have the potential to change the *process* of architectural design.

Computer-aided design provides architects with a highly effective simulated 3D design environment. This is a significant shift from the two-dimensional process architects have practiced for centuries. The 3D nature of these tools invites the designer to think and act in the third dimension to a greater degree than previously imagined.

Educating the process of digital design as an endeavor independent of the design studio is required; this is the issue of this paper.

"Process and Methods of modeling form – space and presentation" has six basic educational goals:

1) To teach students to design "on screen," as an alternative to the traditional plan and elevation process; to understand the value of a digital-based evaluation and prediction process.

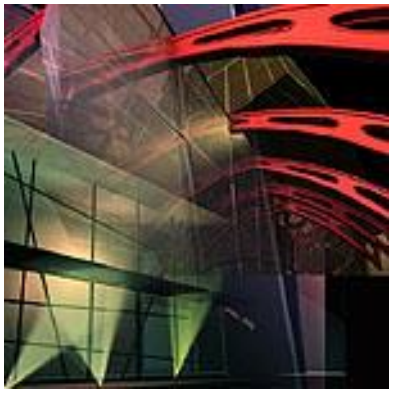
2) To encourage students to design more three dimensionally, using a variety of complex, organic, and/or compound curve based shapes.

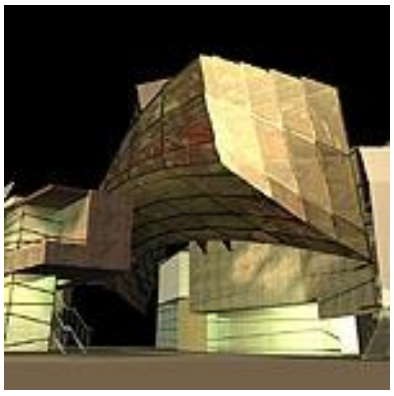
3) To encourage students to use digital design in their studio courses.

4) To teach students a comprehensive digital design process, beginning with initial massing studies and ending with high-resolution presentation drawings.

5) To expose students to the image-making opportunities of realistic rendering techniques and their role throughout design.

6) To expose students to the opportunities of graphic design via the computer and to explore presentation methodologies beyond the painterly approaches of architectural tradition.





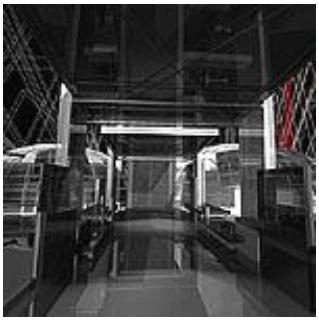
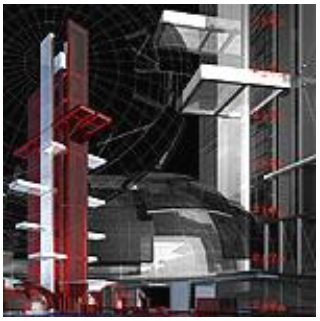
Sport City is a stage for the extreme sport players, signifying a new age of dynamic movements, designed by Elisa Lui, an architecture student at the University of California at Berkeley.

A finished design for a simple building, in a 3D digital format, is typically due at midterm. This has required that the problem be simple and that the students be free to design individually, unencumbered by the demands of a normal studio.
The goal is to explore digital presentation as a creator of meaning that goes beyond the traditional use of plan, elevation, or perspective. The 3D design model serves as the foundation.

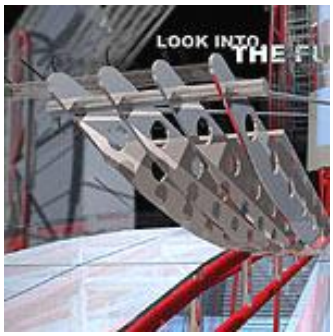
The majority of students are able to study architectural forms which they would never have attempted without the computer as the primary design tool.

In particular students explored designs which range from the "**fluidity of form**", to the more conceptual "supplanted topography" In general, all of the students are creating designs with increasing levels of detail and use of texture maps.

Many of the students used 3D. Programs to study materiality and light in ways deeper than a traditional design method would allow. In essence, the students have clearly learned to use the computer as a true design tool resulting in substantially better designs.

In a student design for Swatch Headquarters, Wilson Au-Yeung used a series of overlapping planes to represent time.



Inspired by Michael Jordan, Han Chung focuses the Monument of the 20th Century Sports on professional athletes' road to success.

FORM AND SPACE DESIGNING PROCESS COURSE:

The institutes (labs) of architecture will educate the methodology of new language of architecture for the future, its main targets as follow:

FORM & SPACE EDUCATING AIMS:

To understand the global architecture in the future, I recommend that we should educate the features of this language and educate how to speak and write with. So my recommendations of the main targets for educating Form and Space should be as follows:

MAIN OBJECTIVE:

The real purpose of this thesis is to speculate the nature of form and space design in the new millennium using the age technology (computers) in our schools of architecture and the world schools of architecture.

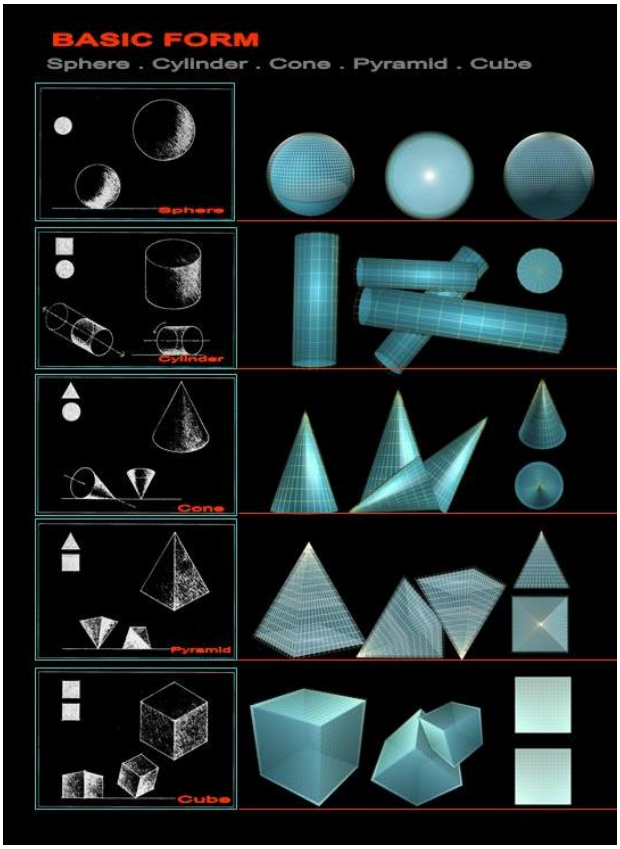
DESIGN PROCESS:

Computers are now being the main tool for educating how to create form and space in the new architectural language; it depends on the technology of computer hard and software. Using Virtual reality technology, students could :

- Understand the meaning of space and form.
- Test the quality of space. Transform and modify in order to fit the requirements easily shapes, forms, openings, lighting, furniture, finishing materials, colors, technical instruments, etc. design process goes through different phases :

○ **Programming:**
▪ Receive a scant program from their professors,
▪ Briefly enhance condensed program through some research and sketching,
○ **Design Parti:**
▪ Lots of effort spent developing overall concept,
▪ Effort spent on emphasis of studio and current project,
○ **Design Development:**
▪ Some incorporation of structures, behavioral sciences, etc.,
▪ Majority of time places emphasis formal manipulation,
○ **Graphic Presentation:**
▪ Majority of time adding color, materials and other nuances to make artifact appear real,
▪ Presentation media dependent upon instructor while quality dependent upon student skills,
○ **Evaluative Presentation:**
▪ The jury process that is both a boon and a bane,
▪ Feedback not applied to current project,
▪ Etc.

Our form-space courses educates students the way of working in 3D is by means of Solid Modeling. In this case one works with the set of primitives (sphere, box, wedge, etc) given in the Solids Toolbar, and by means of transformation operations (subtractive, additive, or modifying) derive more complex shapes.



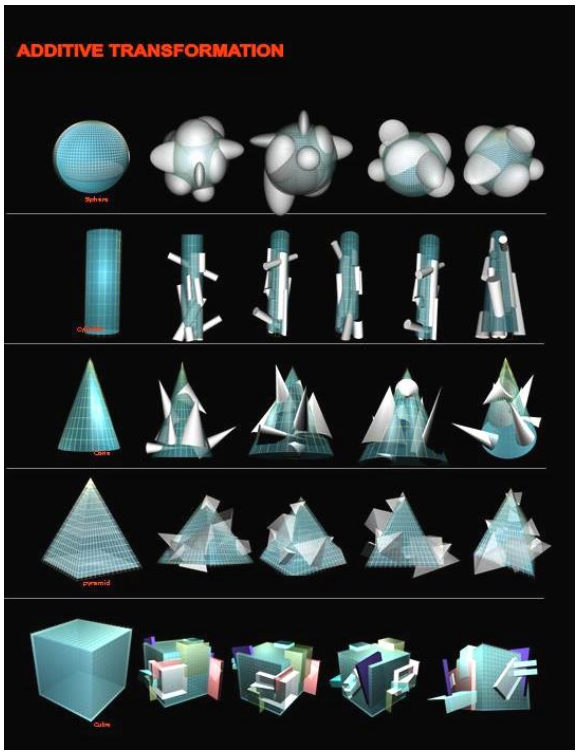
The best strategy usually is to first define the primitive shape, and then by means of Move and Rotate place it in the right position and orientation. Use the transformation operations to reshape your object form for the required meaning needed. Now in our school of architecture (Ain Shams University), first year architecture, theories of architecture, students learn the ways of transforming basic forms by subtractions, additions and modifiers as follow:

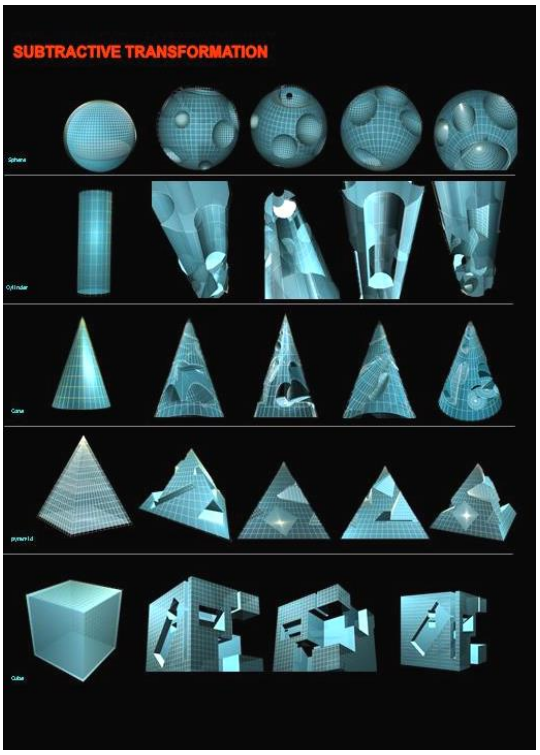
1. **Subtractive transformation.**
2. **Additive transformation.**
3. **Transformation by modifiers.**

Student can create

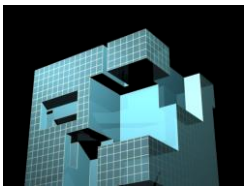
the basic forms in the computer, and easily rotate and intersect each form to the other forms (the same family or different family).
Each movement or intersection of form student and educator can see by animating his design model on the screen.

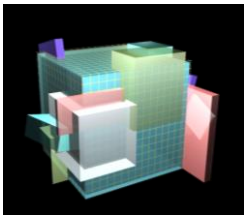
Transformation of basic forms:





Additive and **subtractive** form transformation (using same or different shapes/families). Student can see his additions from every view but he could animate his model as an exteriors or interiors animation. he can go in to the space of his articulated form to test its quality by transforming.
After completing the additive or subtractive transformation he can edit materials, colors, furniture, and lights in order to test space and form under lights (shade and shadows) as a primary phase.

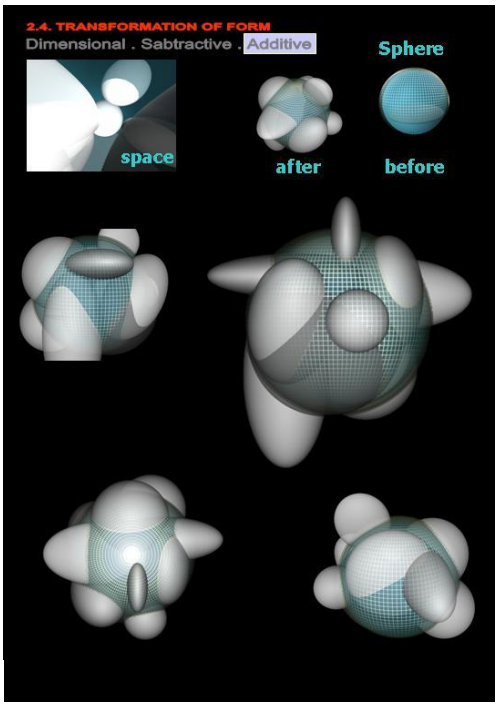


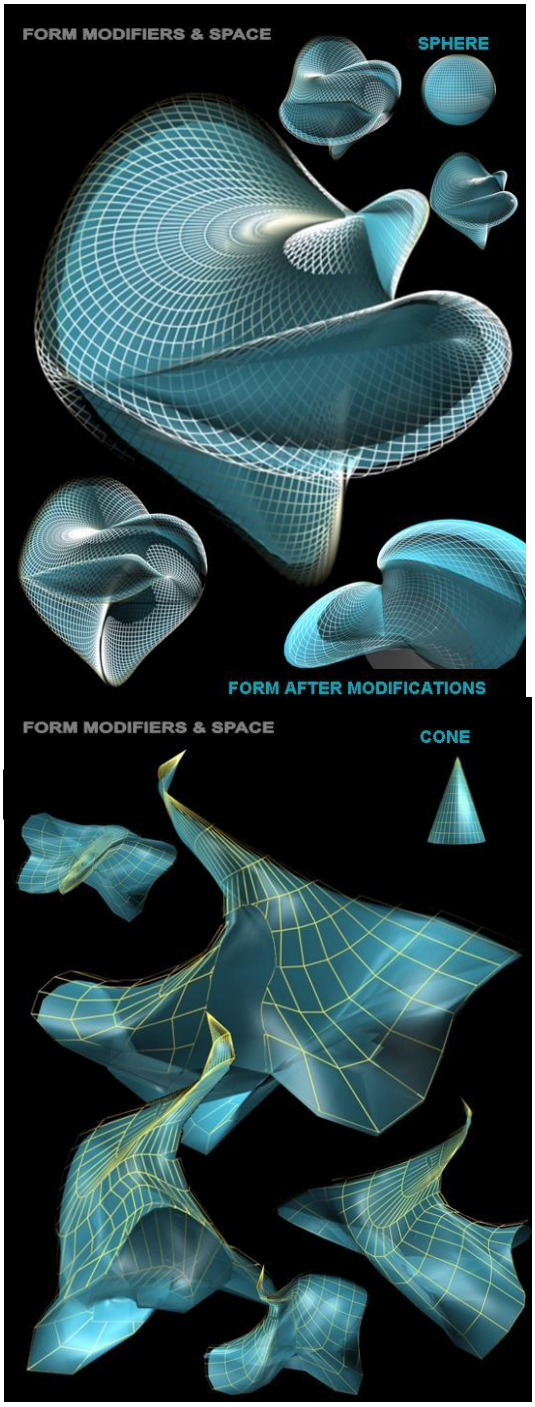


Student's digital animated model (first year-architecture)

Lecture digital animated model (first year-architecture)

Creation by additions and subtractions is endless by using different families of basic form. It is an exercise for the first year architecture students of my school; even they do it using physical or computer models. Transformation by using **Modifiers** is a computer option it is recently be one of transformation methods in our courses for first year architecture students. It is an option to create new forms with new geometry and specifications.





Additive

Modifier

Student by using 3D.computer programs could create new forms by modifiers. As he designed his new space-form he can regularly tested it by virtual reality (VR) its active animated projection on The computer monitor, he could re-design any part of his building / object within his walking through it, he could affect his object by many kinds of forces to create the required meaning of space and form. He could edit materials, colors, lighting, furniture,….etc. within his activated VR. Test.

Computer's technology and 3D programs gives students and educators the option to create new forms –spaces with new meanings by using new ways of representation.

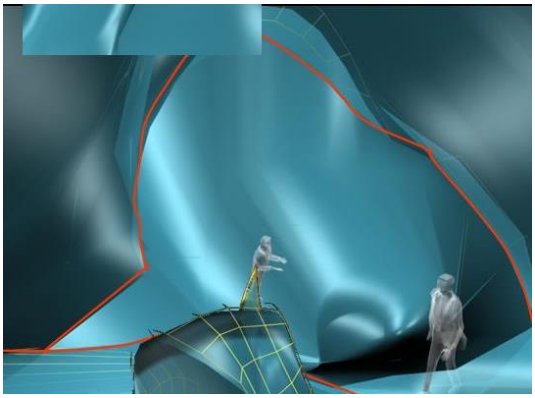
Digital Design Grows in Education

Schools such as the New Jersey Institute of Technology and the University of Oregon as an example have integrated computers in design studios for over a decade. Many others have now followed suit, including Miami University in Oxford, Ohio.

Michael Dingeldein, AIA, vice-president of Steed Hammond Paul Architects in Hamilton, Ohio, and former chair of the AIA's Computer-Aided Practice Professional Interest Area, also teaches at Miami.

"*I have no doubt,"* Dingeldein says, *"that working with 3D modeling software makes the students better 3D thinkers. The amount of information they can imagine and test extends their design abilities by far*."

Other schools, such as the Massachusetts Institute of Technology, the University of British Columbia, and the University of Hong Kong have experimented with worldwide **"virtual studios."**



lecture digital animated models(first year architecture)

In these studios, students from around the world team up to design together and work out solutions to communications problems brought on by collaborating across time zones and language differences.

Robert Woodbury, an architecture professor at the University of Adelaide, Australia, observes that other innovations in exploiting technology have also come from academia rather than the profession. For example, most CAD-based urban models now in use by governments around the world were built in architecture schools.

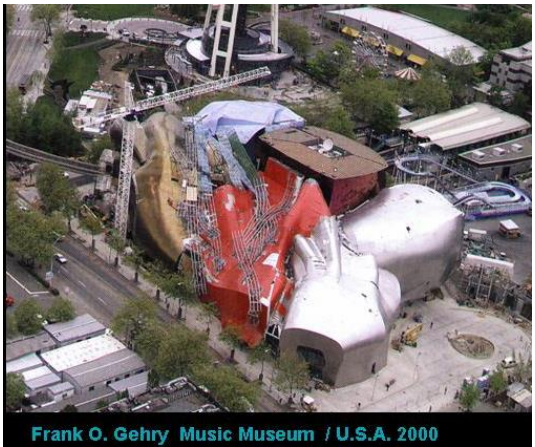
Woodbury notes that as students come to college with an unprecedented software fluency, professors who once taught how-to computer courses are instead looking for ways technology can help foster creativity, communication skills, and critical thinking.

What Students Bring to the Office?

Without the pressure to produce real buildings, students are freer to experiment with imaginative design techniques that would be unrecognizable in a professional setting.

These techniques have the potential to transform the profession, but some adjustments to firm culture may be needed before the skills brought by interns (most of whom are, after all, still inexperienced in the practice of architecture) can be appreciated and adapted by practitioners.

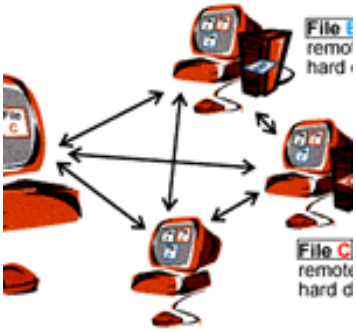
As both teacher and practitioner, San Francisco architect *John Marx* is familiar with these issues. He observes: "The problem is that even though they know **how to generate form**, they don't yet understand the building types. So our goal is to help them acquire the



background they need in how buildings go together pragmatically.

Marx agrees that 3D **modeling improves students' three-dimensional thinking**. However he notes that the proportion of outstanding designers has probably remained constant despite the emergence of technology.

A Case Study in Technique Innovation



While many schools now teach 3D modeling in design studios, as our school some are dabbling in still more experimental processes. While a graduate student at the University of Oregon, *Francis Dardis*, now of the Portland architecture firm BOOR/A, experimented with innovative graphic techniques for generating unusual and imaginative imagery.

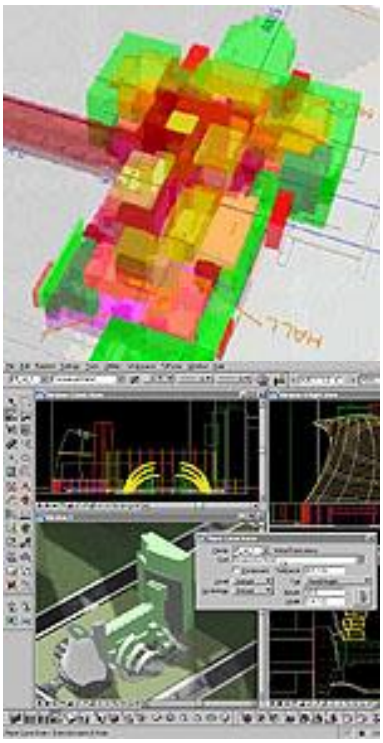
Encouraged by professor *Daniel Herbert, Dardis* would begin with a physical model of a simple concept. Then he would place the model on a scanner and create a 2D image which he would subject to a variety of "filters" with Adobe PhotoShop. These filters perform such manipulations as adjusting contrast, adding textures, blurring lines, changing colors, and so on.

Some of the results were surprising and evoked new design ideas. These were sketched and scanned, and the cycle continued. In the end, *Dardis* came up with a credible project but with richer imagery than in typical student projects.

Although he has not had the opportunity to apply such novel techniques in practice, he has found that taking the risk of including experimental imagery in his portfolio made him more interesting to prospective employers.

Dardis, who also teaches, observes that these richer imageries lead students to a more idea-laden design process. "With the more generative process linking computers to design process," he says, "students more readily accept the computer as an integral tool in their media repertoires."

He adds: "This acceptance helps students to benefit from image manipulation tools, 2D drafting tools, and 3D modeling." He advises that an intern's ideal portfolio would demonstrate a balance of 2D drafting skills and adventurous imagery.



What Practitioners Can Do?

Even as interns' portfolios become more populated with computer work of all kinds, they still tend to lack what they have been traditionally weakest in: evidence of an understanding of materials, details, construction methods, building codes, and other practice issues.

Learning about these most often occurs during apprenticeship. In the past, such learning was associated with years of manual drafting under the supervision of a more experienced architect.

Computer technology is, ironically, depriving many interns of this experience for several reasons. Some of those who come into a firm with very strong modeling skills may be sequestered in a narrow design niche where they do not have the opportunity to develop other skills.

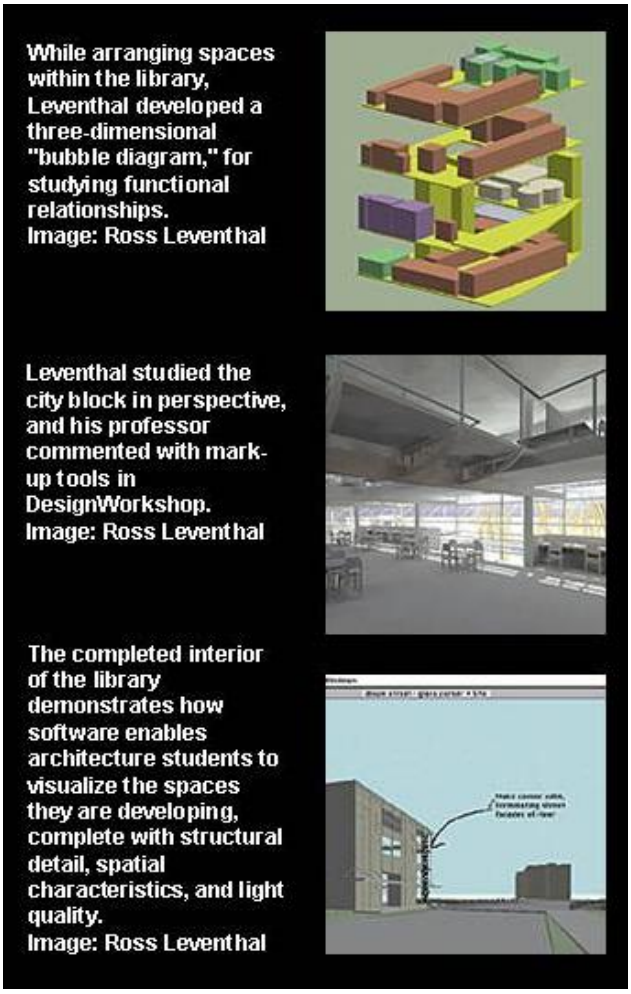
More serious, perhaps, some young people new to a firm find no opportunity for mentoring. The senior designers may feel it's more efficient to do all their drafting themselves because they can do it on a computer as fast as they can think about it, and even large projects can now be conducted by relatively small design teams.

Ten to 15 years from now, many of those in the middle bracket of experience will have come up through the ranks without learning everything about practice that their predecessors did. What will this mean to the profession and to the quality of buildings?

Dingeldein says his firm is confronting this situation in several ways. Because most senior designers are not yet fluent in 3D modeling, they will often team up with younger designers, thus offering an apprenticeship albeit a nontraditional one.

But this is not enough, he admits. "Interns come into a firm," *Dingeldein* says, "and think all they want is to be under the wing of a designer. But when it comes time to pass the licensing exam or put a building together, they will not have sat through a long drafting experience or seen how a wall section is drawn."

One way to address this problem, he says is to require mid-level job captains to take on more jobs, thus forcing them to use more intern-level help.



While arranging spaces within the library, Leventhal developed a three-dimensional "bubble diagram," for studying functional relationships.
Image: Ross Leventhal

Leventhal studied the city block in perspective, and his professor commented with mark-up tools in DesignWorkshop.
Image: Ross Leventhal

The completed interior of the library demonstrates how software enables architecture students to visualize the spaces they are developing, complete with structural detail, spatial characteristics, and light quality.
Image: Ross Leventhal

What Students Can Do to Prepare?

The dilemma for students is that computer technology is giving them more, not less, to learn during their school years. There is probably no single school that regularly turns out graduates with solid grounding in all the areas of design, theory, and practical experience.

At the *Boston Architectural Center*, the curriculum emphasizes practice-related

work. Every student is required to work in a firm full time while going to school at night. Those who survive this grueling regimen, which can take eight to ten years, emerge with practical skills that make them more readily employable than traditional students.

A recent BAC graduate, *Corina Martinez*, has worked at the Boston firm of Shepley, Bulfinch, Richardson & Abbott for several years. She says her background enabled her to come to her first job with a more realistic view of the kinds of work interns are typically given.

While in school, she was careful to balance her 3D modeling and 2D drafting courses. Now she is creating a computer-based graphic standard for the firm's master plan projects. Still, like any intern, she has to be vigilant with her employer to allow her to expand her skills into all of the areas laid out in the Intern Development Program (IDP).

The IDP is a joint program of the American Institute of Architects, the National Council of Architectural Registration Boards, the Association of Collegiate Schools of Architecture, and The American Institute of Architecture Students.

Martinez recommends that students become familiar with the IDP categories before they finish school so they'll know where they may need to expand beyond the horizons of their formal education.

Adapting to a new professional culture brought on by technology will require flexibility among all concerned: students, professors, and practitioners. A good way to start will be for each group to see what the others are doing and to understand the differences in expectations.

Professor *Woodbury* says: ***"For better or for worse, computing is changing the field of architecture and will continue to do so. I believe that as academics our best role is to seek those changes out or to create them, to challenge them or foster them, and to try to make the inevitable more interesting and productive."***

A Case Study : digital student's projects / Egypt:

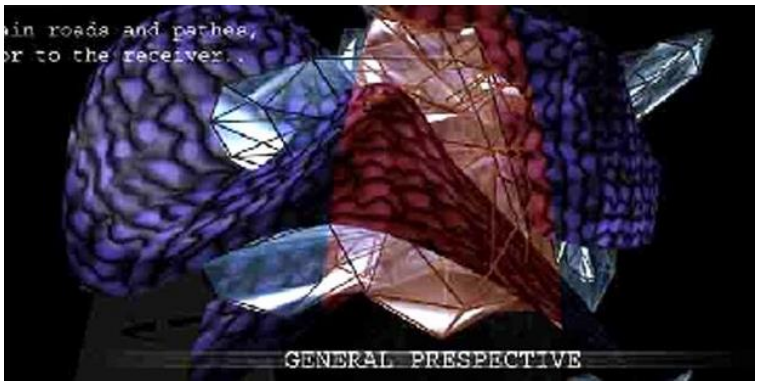
Ain shams university – faculty of engineering-department of architecture

As we had interview with many educators and architects around the world, now I am going to introduce some of our student's projects that had been designed completely by the computer. Starting by modeling the sketches, it's a new way of thinking gives a new form-space, new architecture that not easy to accept in our academic world, but as we have a traditional thinking of students we encourage some of them to create new architecture for the nearest future which I believed.

Students digitally manipulating projects: New thinking in 3D – new form and space.

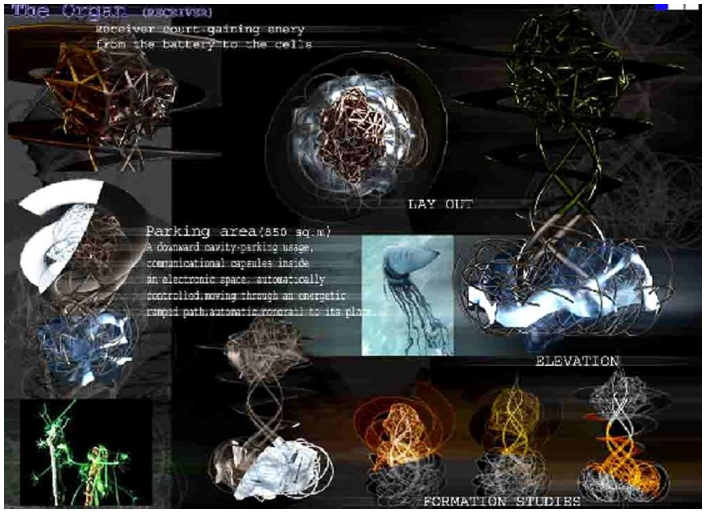
project (form process images):

student: Haitham Abdel Latif
(final year architecture2001)

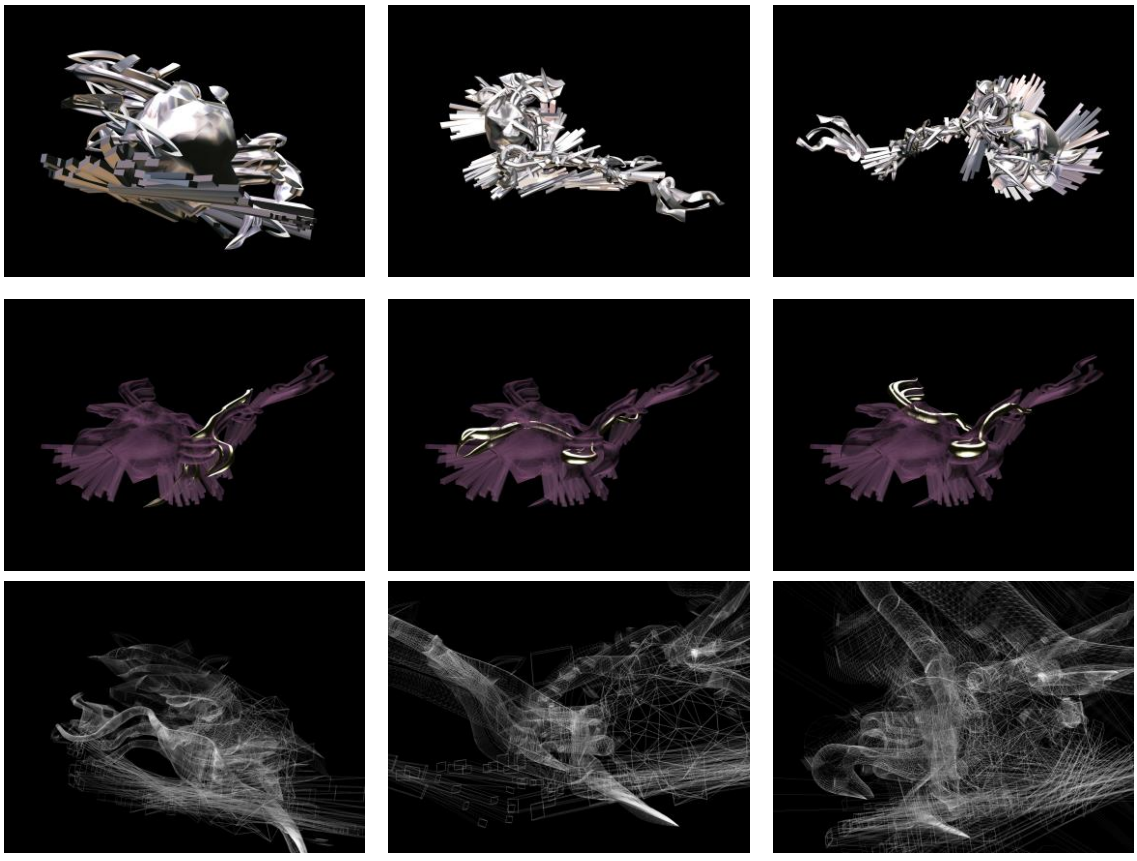


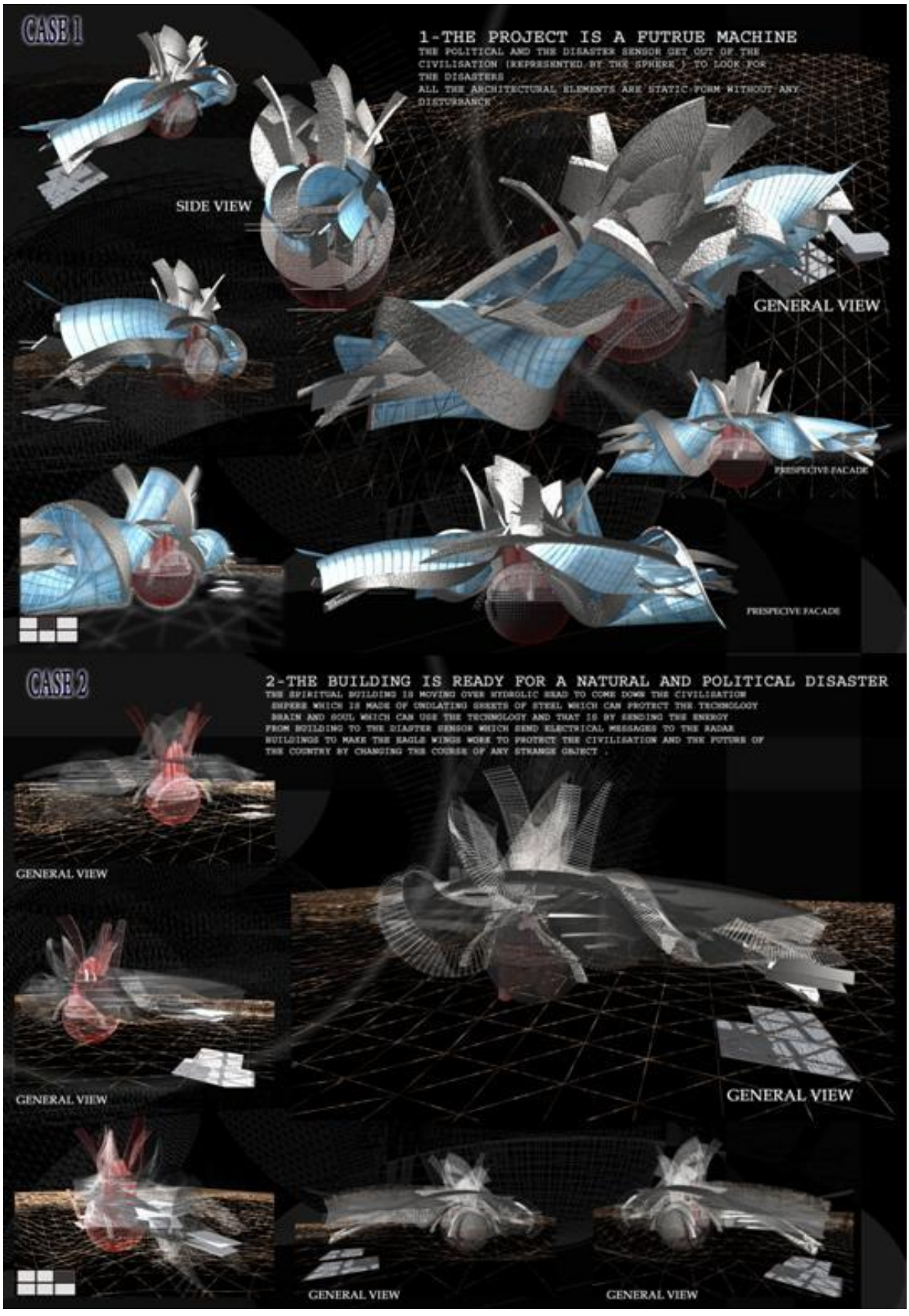
student: Haitham Abdel Latif (final vear architecture2001)

Digital representation of digital form processing: new architectural features and specifications.
Project
(form process images)



Student: Iman Samir Bahzan
(final year architecture2001)





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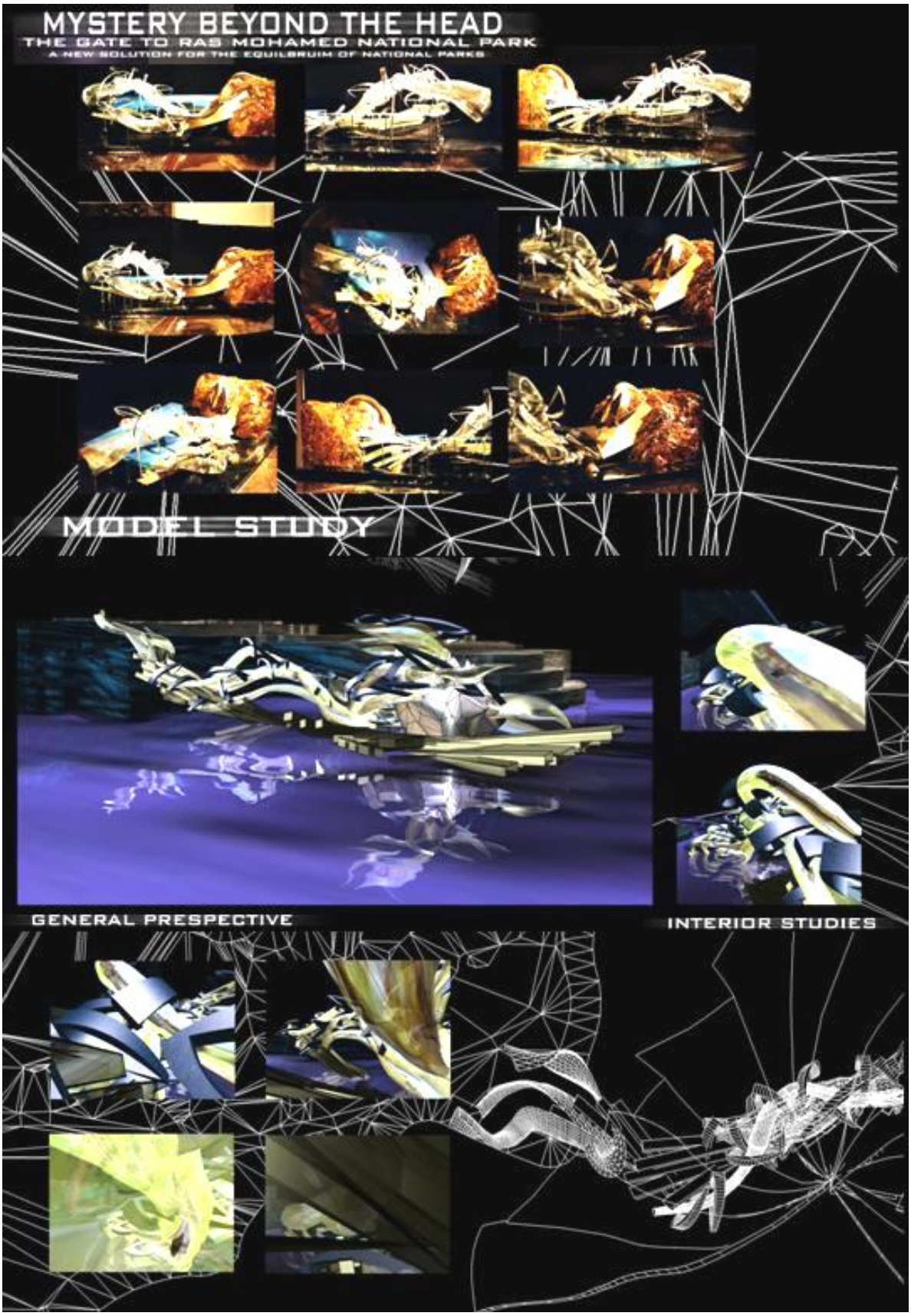

student: Iman Samir Bahzan (final vear architecture2001)

So after this investigation of computer and digital architectural education for the new millennium leads me to speculate believing for the nearest future as a conclusion;

- I believe that computer systems definitely are going to change the way of thinking and representing creative ideas of designs which is happen today.
- I believe in the electronic life of the future, we should work on that.
- I believe that computers will control every thing in our future life, but will never control our artistic talented brains that are ruling the mainframe of those computers.
- I believe that we will have a new architecture, which will never be easy to accept or to understand, unless we believe on the future exchange.
- I believe that our homes will be mobile which could be moved to different sites.
- I believe that architectural institutes will be transforming the drawings studios to computer labs to educate new architecture.
- I believe that technology will transform the methodology of architectural education more and more.
- I believe that we must change our foundation of tradition in understanding to understand the progressing context of this time and future.
- Architecture is true futurism, future (convention). Vision of the not yet achieved. Potential spaces, possible space, only in the hyper mind, vision of the possible alternative future, parallel realities with or within or without, source of inspiration.
- I believe that buildings in the future will be different products from different factories which industries many types of building moved to different special sites or places.

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