Technology as Design Inspiration: Three Lighting and Architecture Projects

LUCIE FONTEIN
Carleton University

INTRODUCTION

Most of you will be familiar with the awful feeling one gets when one puts money down to buy a computer: How long will it be before this model becomes obsolete? Will it have sufficient memory to handle the software you want to use? What about software that doesn't even exist yet but is likely to be developed in the next years? What kind of hardware will you need to run that? You know that the "great deal" you are getting on this "state-of-the-art" item now, will be nothing compared to the "great deal" you would be able to get next year if you were willing to wait. The feelings are ones of frustration and impotence.

The fact that obsolescence is a necessary consequence of "progress" is merely a symptom of larger philosophical concerns we face as members of modern society. Heidegger, in his essay *The Question Concerning Technology,*[1] helps to define the condition in which we find ourselves. He claims that the original sense of technology as the bringing forth of things into appearance has been subsumed by a single-minded type of revealing which he identifies with the modern instrumental way of thinking. Today technology is capable of revealing only one thing: that the things of the world are ordered exclusively according to their ability to store energy (the universal currency).

This type of thinking has an enormous impact on the way the building industry functions. Research and development teams are on a constant quest to develop new products which are more energy efficient and less costly.

The students are fully aware of the speed at which the world is changing. As "home pages" on the internet are updated daily, they know that many of the products they learn about in class may well be obsolete by the time they graduate.

How does one teach architectural technology in this context, much less derive inspiration from it, as I suggest in the title of my paper?

The major focus of my work over the past few years has been to develop a stimulating, inspiring, thoughtful, critical course in "Lighting and Architecture." The course is a second year course in a 5-year professional B Arch degree. The most important move has been to incorporate a substantial design component into the technology lecture course. This has been achieved by instituting a core set of project assignments which explore three lighting design issues in depth. These form the skeleton around which the rest of the course is structured. The lectures situate the issues historically, establish the terms, references and scientific theory appropriate to the topic, and introduce the practical skills and techniques required to produce the assignment. Most importantly, through the presentation of case studies and precedents, the lectures furnish the students with manifold ideas and the inspiration to push an idea as far as possible.

Fundamental to the course is the underlying theme having to do with critical reflection regarding the role of technology in contemporary culture. The introductory lecture explores the meaning of the word technology, juxtaposing the original poetic sense of revealing with the modern sense of technology as that which is invoked to solve problems by the most efficient means. I borrow Heidegger's examples to illustrate my point: the difference between modern technology and the original sense of technology is like the difference between a hydro-electric dam built into a river and a windmill built in a field. Both produce energy but the first traps the water and stores it as potential energy to be released when needed. In the case of the windmill, the power intrinsic to the wind is released as soon as it is captured in the rotation of the vanes and is converted directly to mechanical energy in the grinding of the grain. If the wind stops, the milling stops. The power of the wind has been revealed yet it has not become the servant of technology as it has in the case of the dam.

Were that it was so simple as to return to the days of the windmill. But clearly that is impossible. What is more, windmills too have fallen prey to the instrumental way of thinking. Wind is now being harvested and its energy stored not unlike any other crop or industry or any other human activity for that matter.

We cannot nostalgically return to pre-technological tenets. It is my profound belief that we must embrace current technologies, but from a critical perspective which restores

value to, and celebrates that original capacity of technology to reveal. **This philosophy provides the program for the three project assignments of the lighting course.**

ASSIGNMENT 1: DAYLIGHTING DESIGN

The first assignment provides the students with an opportunity to explore the potential of daylight to compose and orchestrate a space; to create a particular architectural character. It is intended that the students become so familiar with the movement of the sun throughout the day and during the course of a year, that it becomes second nature to them. They also develop a sense of the quality of light at these different times and with respect to the different orientations. Finally, it presents an opportunity to experiment in a very direct way with the techniques of lighting design presented in the lectures (overhangs, lightshelves, baffles, etc.)

The students are given a box upon which to experiment. The box is an 11 x 17 copy paper box which is given the scale of 3/8" = 1' - 0" to represent a building on a site on a low density urban street.[2] One of the long walls of the box/building is a party wall. The north arrow is determined with the arbitrary twist of a pencil. The functional program is left extremely loose suggesting simply that the space might be used as a restaurant/cafe/bar. A maximum area of apertures is set to provide some discipline with regard to the care with which the openings are treated and placed (ie., a completely glazed space is not a design option).

At the most basic level, this exercise provides the students with the skills and tools required for daylight design: daylight model building materials and techniques, the recording and graphing of illumination levels, the photo-documentation of direct sunlight conditions using a sundial placed on the model to identify the different times of the day and year. These are valuable skills which can be easily translated to studio projects.

But more important is the idea that instead of starting the design process with a functional program or formal idea, the students start with a concern for the movement of the sun and a desire to enhance the user's awareness of that movement; to "reveal" that movement. The restaurant becomes an instrument of measure of the movement of the sun and the qualities of daylight. It takes on the character of the windmill.

Example: Daylight model study

These students began with the intention of creating very different lighting conditions for different times of the day and year. Very quickly they realized that in order to be very precise with the manipulation of light, they needed to target a particular time of the day and keep the apertures small. Since the bearing angle is constant at noon on all days (due south), the noon hour was chosen as the target time for the restaurant lighting design. This allowed for the possibility of manipulating the altitude angle in order to privilege particular times of the year. For example, special focus was placed on the menu board which was stratified into different layers vertically such that in winter the top of the board would be lighted, in spring and autumn the middle section would be lighted and in summer the bottom. Similarly the translucent panels above the tables would receive direct sunlight and really sparkle at different times of the year. Additional foot-level lighting was introduced to provide minimal but adequate lighting for circulation around the restaurant. Special attention was paid to the entrance vestibule as a transitional space where the eyes could adapt to the lower light levels of the interior space.

Fig. 1. Daylight model study interior, Doron Meinhardt and Randall Rowatt

The success of this project is that it is the daylight design that defines the functional program rather than vice versa. The character of the restaurant as a relatively dark and intimate lunchtime dining venue where the menu changes according to the season, has grown out of an interest in the movement of the sun. The power of the sun is recognized and celebrated but its potential for supplying light and energy does not dominate to the point where it excludes the possibility of considering it in any other way.

This initial project sets the tone for the rest of the course. The sun being the original source of all energy, acts as an ideal example of the possible bridge between technology as revealing and technology as storehouse of energy.

ASSIGNMENT 2: LUMINAIRE DESIGN

To date, the second assignment has been the most successful of the three as a means of conveying to the students the philosophical agenda which privileges the creative capacity of technology to reveal. This assignment explores sources of light other than the sun. The students are each supplied with an electric light source from a variety of incandescent, halogen, fluorescent, compact fluorescent and H.I.D. lamps. These become the starting point for the design of a light

fixture. Again, unlike common practice, the program (function) and the site of the fixture will be the result rather than the initiator of the design process. The design process starts with the source itself and a desire to reveal something about it: its shape, the colour of the light it produces, its beam shape and intensity, its efficacy, etc.

Example 1: 500-watt halogen light

The heat produced by the bulb is not seen as a negative but is celebrated. The convection current created by the source is used to rotate an airfoil shape above which is perforated in places to project a pattern onto a more distant surface. The high intensity of this tiny point source is revealed through the clarity of the projected images. Taking the project the next step, one could imagine designing a room which would complement the light by providing a variety of surfaces upon which the projections would fall.

Example 2: 4' fluorescent tubes

These students explored the linear quality of the fluorescent tube by actually encasing the ballast in a concrete base and encircling the tubes with re-bars to make a kind of light column. The re-bars accentuate the verticality of the tubes but also reveal their fragility by acting as a kind of armour against accidental breakage. The toughness of the unfinished concrete complements the bare fluorescent tubes, attaching aesthetic beauty to the raw materials. Again, one could begin to imagine the architectural possibilities resulting from this starting point; the integration of lighting and structure, the palate of "raw" materials, etc.

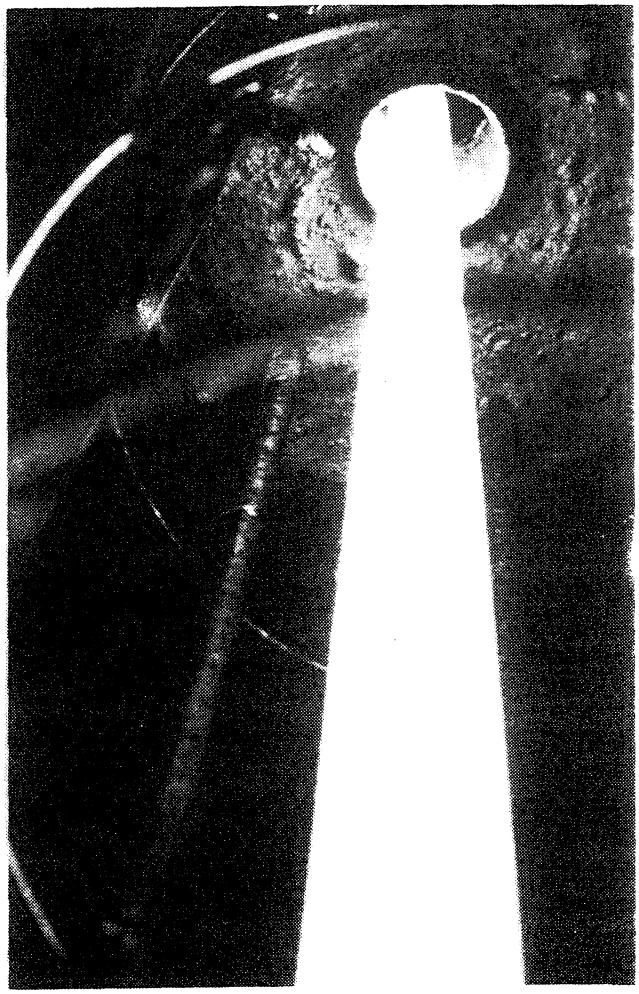

Fig. 2. Luminaire design with two 4' fluorescent T8's, Chris King and Annette Lippert

Example 3: Compact Fluorescent

So much of the lighting industry is bent on recreating the character of an incandescent source using the more efficient compact fluorescent source. Promotion of compact fluorescent lamps focusses on energy efficiency and the environment, pitting them directly against incandescent lamps of the same lumen output. It is a tough sell however. One of the reasons for not fitting all compact fluorescent bulbs with built-in ballasts and regular screw in bases is because it would be too easy for the user to replace the less attractive compact fluorescent lamp with the more familiar incandescent. The underlying message is that we have to compromise on aesthetics to protect the environment and save money. This is consistent with the technological thinking which surrounds most of the building industry. Our built environment is being constructed of simulated materials which are inevitably found wanting if they are considered in terms of their capacity to match their authentic source materials. This assignment promotes a more positive approach to compact fluorescent sources by exploiting the particular character or shape of the source for what it is rather than for what it is attempting to imitate.

The students who were assigned the compact fluorescent lamp were intrigued by the fact that it produced relatively little heat. This suggested the possibility of bringing other materials into direct contact with the tubes. The folded shape of the tubes provided slots through which slender sheets of metal, plastic or even paper could be threaded. In this case the winglike shape speaks of the etherial, insubstantial nature of the source. It recalls the magic of the phosphorescence of the firefly or the fish that glow in the darkness of the depths of the ocean beyond the reaches of the sun's penetration.

Assignment 3: Electric Lighting Design

The final project approaches electric lighting design from a similar perspective. What can electric lighting design reveal about the impact of the positioning of light sources in a room, the controls and wiring associated with electric lighting, the integration of the lighting system with other building systems, etc? The site is the same as that of the first assignment.

The practical objectives associated with this assignment are to familiarize the students with the world of lighting catalogues and sales representatives, to interpret electrical drawings and produce a simple lighting layout (including

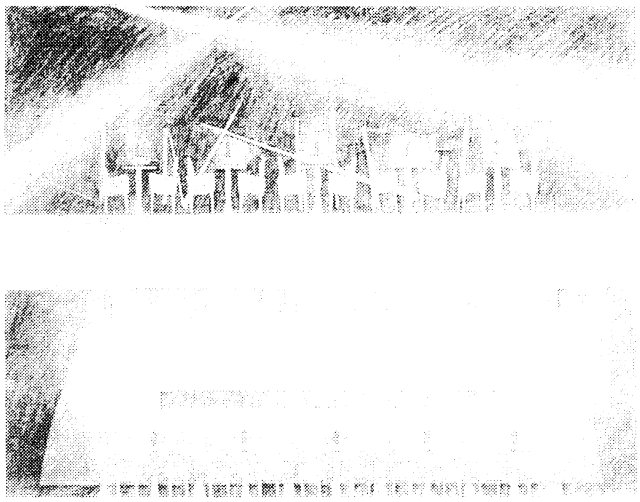

Fig. 3. Electric lighting design

switches/controls, exit sign locations, etc.) and to learn to do basic illumination calculations. Techniques for rendering light in presentation drawings are also explored.

To date this last project has been less successful than the other two. The fact that I find it more difficult to grade is a sign that the issues are not as clear and that the criteria for marking rely more on a subjective response to the work. The students tend to revert to the traditional way of **applying** technology to a design rather than letting it **inspire** the design. The lighting becomes a support for the activities which are to take place in the restaurant.

What has gone wrong?

For one thing, this last assignment leaves the hands-on realm of the first two projects and returns to the realm of architectural representation. A good project then, becomes one which renders light in a convincing way. And even if the light is rendered well, there is an enormous chasm between the representation and the real experience of the light. How, for instance, does one accurately explore the colour of light in a rendering? Even with computer rendering this is difficult.

Secondly, it is possible that revisiting the site of the original daylight assignment is perhaps also a mistake. The architectural design has become too inflexible in the minds of the students.

In the future, the final project will be structured in such a way as to make it impossible to fall into the trap of **applying** lighting to a space. It is not that this is inherently a bad thing. Lighting does not necessarily have to take a prima-donna role in an architectural project. In the context of a course on lighting and Architecture however, it is necessary to convey the idea that the electric lighting has the potential for **inspiring** the architectural design and by extension, that any of the building technologies has this same potential.

CONCLUSION

My primary aim has been to introduce design as an important component of a technology course. Equally important however, is the **focus** of the design. The crucial distinction exists in the attitude towards the role of the particular technology in the design process and the criteria by which the design will be judged. As long as a technology is evaluated based on its capacity to solve a problem efficiently, it is inevitably doomed to obsolescence. There will always be a better solution, a new and improved product, which will come onto the market the next day, next year, etc. We must change the terms of reference.

This is the fundamental objective of my teaching methodology. Architectural technology must not be considered in absolute terms but rather must be fully appreciated for its dynamic nature. It should not be simply applied to design, but rather inspire design. My hope is that we can address this issue by contemplating the essential nature of technology to reveal. If this capacity, rather than the absolute technological product, becomes the motivating force in a design, the design need no longer be judged according to its capacity to show progress. It will endure because it is referencing itself and has removed itself from the competition to be bigger (or these days smaller) and better.

NOTES

[1] Martin Heidegger, "The Question Concerning Technology" in *The Question Concerning Technology and Other Essays*, New York, Harper & Row Publishers Inc., 1977, pp.12-20.

[2] The idea of using a photocopy paper box in which to model daylighting designs is not my own. It is the brainchild of Barbara Erwine. The way the project is framed however, is original.