

Good Evening [1]

Welcome to Architectural 523, Technology III: *Environmental Controls*. This is the course which teaches about Thermostats and Toilets. [2]

Not, I hope, at the same time.

[3] My name is Jeremy Kargon, a contract lecturer here at IAP this year. For those of you who haven't noticed me yet, running around in the studio next door to Bill Chan's, I also teach the second year studio sequence. I'm an architect in private practice here in Baltimore, the city where I grew up and the city to which I returned after a long time living abroad.

Since this course involves the study of environmental factors and the design of buildings and human habitats, I'll confess that I did *not* return to Baltimore because of the weather.

But that's another story.

Our story this evening begins with another consideration, which might be surprising, considering the technical character of this course's title. I want to ask each of you to think, for a minute, about the following question:

What makes us *human*? [5]

That our physiology is unique goes without saying. But what aspect of human behavior distinguishes our species? How are we different from other primates, from birds, from reptiles, or from bears?

How are we different from bugs?

Typically, answers to this question emphasize our cognitive behavior. We're smarter than bugs (most of us), or else we're more spiritual than bears. [6] That bees can communicate, or that bears give good hugs and backrubs, seems at least to suggest that cognitive assessment may be a matter of degree.

Same for technology. "Humans make things," is one common answer. And as architects, we can point with pride to our structures built for service and shelter. The Taj Mahal. The Eiffel Tower. But, of course, in this we are not alone, and we can all think of other animals which have a fair record of civil engineering [7]: Termites, for one, or beavers for another. Animals use tools, too, and they have been known to farm other animals. They make trash.

Hear that? We're not alone, *even in making trash*.
What, then, makes us different?

Well, apropos the title of this course -- Environmental Systems -- I'd like to suggest that there is a simple answer: Fire. [8] The *release* and *control* of heat energy.

Think about it: It's our oldest technology, and our most significant tool. In the mythology of the Greeks, the use of fire was taught to us by Prometheus, whose name means "forethought." [9] That's right, it was the Power of Forethought -- the power of planning, the power of *design!* -- which allowed us to warm ourselves and to give ourselves light in the darkness. It was this skill that the Greek Gods feared most in our hands. For the Greek people, on the other hand, it was the gift of fire established our ascent from our rude, animal corporeality.

So perhaps it's an intellectual conceit [10] -- and here's a visual example of a similar one -- but I'd like to challenge you this semester with the following proposition: [11]

This course, Environmental Systems, is essentially about the way in which our Designs embody our human nature. This course is about how we choose to do this, and how our doing so reflects both upon our technical abilities and upon our ethical point of view. This course is about, in a sense, our balance between our impulses and our "forethought," our Prometheus.

* * *

[12] Hey, and it's also about plumber pants, about stink pipes, and about ducts sized by ACCA Manual J, Manual S, and Manual XYZ. There's a lot that I know about the practical use of mechanical systems in buildings, and a lot more I don't know. The ironic premise of a course like this is that its relevance is in its generality, not its specificity. Few ar-

chitects, in their daily practice, direct their efforts towards the conception and design of Environmental Systems. They hire consultants more expert than they to do that. [13] Now, perhaps that's a bad thing, and perhaps contemporary architects are abdicating their role the Master Builders in this still-industrial society. [14] And perhaps there are significant exceptions, architects who see beyond space-making, form-making, and towards environmental concerns. But -- in my reality, and in yours -- it's a fact, it's a done deal: Come across a job any bigger than a bread-box, and the architect will seek an engineer to design the mechanical and electrical systems.

So why are we here? [15]

To be sure, in this course, we will learn about techniques to analyze energy use, about lighting requirements, and about the effect of sunlight upon both. We'll explore together even more recent technologies for waste management and abatement. [16] We'll learn about contemporary standards for air quality in interior environments. In this course, we'll get our technical background in these matters.

[17] But what I hope to engender is more than facts or techniques which will likely be put aside as soon as the course is over. What I'd like to engender in you is that ethical dimension to which I alluded earlier: To design for the use of material and energy resources so that we might incorporate a more thoughtful management of those re-

sources. It shouldn't be news to anyone that our flock, so to speak, is lost. I'm hoping that you'll become better shepards.

[18] We can look around us, here in this room, and see the legacy of more than a century of the ever-refined combustion of hydrocarbons. You can see the exposed ducts of the forced-air system, using carbon-tempered steel merely to channel cold air to an exterior wall, itself designed so poorly that the heat of the outside air serves only to draw even more capacity from the system. Other channels in the winter bring hot water to the same location, keeping warm a wall which is designed the same facing either north or south.

Our electric lights, the energy for which comes from the same combustion of coal and oil as 100 years before, allow us to meet and talk and display our ideas here, long after the sun's gone down -- and who'd have it any other way? But let us admit that we can see here the legacy of our detachment from the planet's natural tempo and from our species' diurnal rhythm.

These days, and because of buildings like these, our feet hardly ever touch the ground. Defined now as a room and a car and car and a room and a room for our cars, our cities have become enervating channels for frivolous consumption, instead of our most efficient form of habitation, as before. Buildings like these -- leaky, obtuse, and oppressive -- are as good as anything to inspire us become better architects, and to challenge the status quo.

* * *

So that's why we're here. Now what, in fact, will we be doing this semester?

I've handed out copies of the course outline. Let's turn together and read the course introduction: [19]

This course presents an overview of the design of lighting and climate control systems that facilitate the comfort of building occupants. Emphasis is placed on the importance of functional, energy-efficient and sustainable strategies employed during the earliest stages of design investigations. The first portion of the semester is focused on the analysis of building heating/cooling requirements, and the last portion focuses on lighting systems.

So far so good. But you can already tell, perhaps, that the potential subject matter includes much, much more than a single course can cover. This is true. So what should we expect from this course? [20]

Upon completion of this course, the student should show clear evidence of:

- 1 A social and historical awareness of the role environmental systems have played and will continue to play in the shaping of our built and natural environments.*
- 2 A basic understanding of the nature and characteristics of the most commonly employed environmental control systems.*
- 3 A basic understanding of how the responsible design of building envelope systems contribute to the energy performance of buildings.*

4 *A nascent ability to make environmentally responsible design decisions that adequately address issues of suitability, economy, operating efficiency, durability, safety and aesthetics.*

Basic awareness, nascent understanding... well, you get the point: If you come out of this course having at least a one light-bulb-going-off-in-your-head experience, in which you get the connection between how you should site your studio design and how you might contribute to the efficient energy use of your design, well, our course goals will have been achieved -- *almost*.

You should *also* have learned how to support your decisions with some quantitative analysis, and about which building technologies will make your decision both feasible and efficient. Some of those techniques are described in the syllabus as Objectives: [21]

- 1 *An analysis of overall rate of heat loss.*
- 2 *An analysis of approximate Solar Savings Fraction (SSF).*
- 3 *An analysis of approximate heat gain.*
- 4 *A Daylight analysis using the Daylight Factor Method for Side lighting.*
- 5 *Daylight level calculations.*
- 6 *A narrative on the potential impact of energy and lighting analyses on building design.*

To get to that basic awareness, this course will require that you buy the following books and READ them -- a lot. [22]

Mechanical & Electrical Equipment for Buildings
Sun Wind & Light: Architectural Design Strategies
Cradle to Cradle

Has anybody bought the books? They should be waiting for you in the campus bookstore, and they are available online. Get to it!

More about the reading in a bit. But I want to add that we will have additional readings in class, based on material which I will give you throughout the semester.

I want to emphasize the following: You will need to “do the reading,” without exception. You will need to “do the reading” in a timely fashion, in the order in which it has been assigned.

Let me explain to you how this will work. At the beginning of each class, starting next week, I will assign a worksheet for you to complete. Think of it as a weekly quiz, or as a weekly reality check -- whatever. This worksheet will be based upon the assigned reading from the previous week, and it will test both your familiarity with the material and your mastery of techniques either presented in class or in the reading. Each week, a new worksheet. These worksheets will be graded and returned the next week for our discussion and review. Your midterm and semester grades will be based on the average of your performance on all these quizzes, together with two additional projects. So that’s the bottom line: I assign it, you read it, and you then get to display to me how much you understood.

Make the time necessary to do the assigned readings!

A few other administrative issues:

[23] Grading: As you can see in the Course Outline, I grade on a slightly curved-down scale. You must complete all assignments before the end of the semester; otherwise, F! If you want to complete assignments after the end of the course, well, you can do it next year when you take the course again.

Attendance: *Mandatory!*

The course outline reiterates Graduate School policy concerning absences, which stipulate that no more than two nonmedical absences are allowed in the course during the semester. If you have a problem with that, you have to take it upstairs.

[24] Some additional housekeeping: The course has a website, onto which I will be posting each session's in-class presentation, along with answer keys to the worksheets after they've been handed in and graded. I will use e-mail extensively to communicate throughout the semester, and in fact contacting me by e-mail is the best way of being in touch. I'd like, therefore, for everybody to "sign in" with your name, telephone number, and e-mail address. As an additional assignment for this week, I want each of you to e-mail me a test message, so that your spam filters won't choke if I send you something in return.

Any questions?

* * *

Let's get to work. I'm handing out copies of the first two chapters in a very important work of architectural history, *The Architecture of the Well-Tempered Environment*.

[25] You will almost certainly encounter the author, Reyner Banham, in other classes, since his books about the history of modern architecture are basic texts for the period, and his work as an architectural critic spanned both the high-point of "modernism" as an international, architectural movement as well as its subsequent decline... or, rather, its fragmentation towards many diverse directions. He died in 1988, about twenty years ago.

But, intriguingly, Banham had also anticipated our most recent, significant architectural trend -- Sustainability -- in this book, which he wrote almost twenty years before that. *The Architecture of the Well-Tempered Environment* begins with what he called an "Unwarranted Apology," the reasons for which he makes excruciatingly clear:

[Interactive Reading, Banham, Chapter One]

[26] I want to show you this image, which was from one of Banham's polemical essays, *A Home is not a House*. No doubt anticipating the categories he laid out in the chapter we just looked at, Banham revels in the *reductio-ad-absurdum* of environmental control outside the legacy of mass and structure to which he alludes.

[Interactive Reading, Banham, Chapter Two]

[27] Let's take a short break, now, and we'll pick up a more contemporary thread: *Green*.

BREAK

[28] Ok, let's get back to work here.

How many of you are familiar with the series, Design E²? As you can see in your syllabus, each week I will be presenting what I call "In-class Media." That means video. The series Design E² is a pretty well-done survey of projects and concepts relating to the theme of Sustainability.

What is Sustainability? Well, as an introduction, why not just sit back and relax...

[Media Intervention: Design E² / The Green Apple]

Well, now that Brad Pitt has us all running for the cloth diapers and the dealership for Toyota Priuses, can anyone tell me why we are discussing these issues in a course about Environmental Systems?

[Discussion about Media Intervention]

[29] Well, this is the ethical equation to which I alluded at the beginning of the session. Design for Architecture, or any of its constituent systems, is a process of making choices; and, as it turns out, these days we are beginning

to perceive that our choices have significant impact on our future well-being as a society and as a species. But our awareness has gone even further. The quality of those choices depends not only on the material alternatives but also on the structure of those choices themselves. You've heard the phrase "Garbage in, Garbage Out?" Part of the ethos of Sustainability is that even with the best of intentions, we can make garbage unwittingly and inevitably if our processes are poorly conceived.

That's where Cradle+Cradle comes in. Here's the "call to arms," not of militant political action, but of radical self-analysis and self-awareness. I'm assigning readings from this book not to teach you about technical solutions to various technical problems, but to allow you to build in your own mind a matrix of concepts with which you can sift the technical problems and methods we'll discuss throughout this course. Keep an open mind. Keep a critical mind.

Towards what? [30] Well: *Towards Better, not "Less Bad."*

That's a great piece of rhetoric, and it's a formulation which appears to be so easy to handle; but, if you're honest about it, you'll find yourself coming up short, constantly. If you're honest about it, you'll put yourself into a neurotic mess; and if *I'm* honest about it, I gotta tell you I'm already more than halfway there.

Why? Because our technical culture, of which this course is a part, is so far away from a healthy arrangement of re-

sources and priorities that it is very hard to bend our bent backs back into shape. Think of that developer in the video, so proud of his “green” buildings and his Toyota Prius. So proud of his being the “lessest baddest” fat-cat developer on the block!

Yet... to be honest!... reading this book left me feeling ambivalent, if only because it *is* a manifesto. It purports to be so all-encompassing, so judgemental, so definitive. It seems so right -- and our lives so wrong. Your reading for next week begins at the beginning and then jumps out of sequence to the middle of McDonough’s case. Perhaps, that way, you’ll avoid the full load of bad-vibes that we can feel when our inadequacies are so precisely identified...

The other assigned reading represents the core of the course as originally conceived. Even the title sounds heavy: **Mechanical and Electrical Equipment for Buildings**. Ta-da!

The first chapter, like Cradle to Cradle, emphasizes design process. And here, too, that process represents the key to facilitating our intentions -- but not as human beings per se. Here, we have assumed the role of design professionals, with our unique jargon, our certifications, and our professional garb. The distinction is profound, and deserves keeping in mind even as one enters the profession. Not that we attain a position -- even in our own minds! -- as a sort of “priesthood” with unique abilities and roles. I think the reality is both less exciting and less sinister than a caste of technological experts might imply. A professional has be-

come, in the United States, a sort of facilitator and expeditor for individual categories of services: Health, Law, or -- in our case -- Development.

That's a point to reiterate: We are not asked, in the main, to design buildings according to concepts which we choose in collaboration with others. Instead, we are asked to make efficient the acquisition of certain goods and services for other professionals and for other service providers.

So when, in the very first chapter, you read about the different phases of the Design Process, keep in mind how regimented and compartmentalized they seem. Certainly McDonough's book seeks to challenge this regimented organization of responsibilities and concept development; and perhaps MEEB, too, alludes to better ways of thinking about our physical environment.

Here are some of the phrases thrown out in the reading for next week: Design Intent; Design Criteria; Methods and Tools; Validation and Evaluation; Influences; and Philosophy. These are valid components of any human activity. Can they be used as a checklist for the design and construction of a building? The ethos of professionalism says yes. You are to decide for yourself. So remember, for better or for worse, there is a status quo, and what you'll be reading is at best an idealized version of it.

So what do I mean? Let me give you an example. As an architect, I might be asked to lay out a speculative office

building, whose floor plate has a unique configuration due to adjacent buildings or an odd geometric condition. What happens then?

[Discuss Typical Environmental Design Process]

Now there are ways to make this process better. There are ways to anticipate the conflicts better, and to keep the decisions which influence “architectural” elements under your own control. For instance, when I begin a project, I use my expertise to anticipate both the overall space-characteristics of the systems, as well as the reciprocal technical accommodations which need be designed.

[Discuss my approach to Consultants, with Superposition.]

So...

That’s what I do. That’s why I’m teaching this course, presumably. But according to both Banham, writing 40 years ago, and to McDonough -- writing now! -- I’m going about it the wrong way. And I have to admit that I believe they’re right. What should I do about it?

[Discuss my alternative approaches to Environmental Des.]

[Hand out Worksheet #1; 20 minutes; collect]