

Thinking toward architecture.

by Michael Benedikt

The following is a condensed and abbreviated version of a lecture that Michael Benedikt delivered to the Faculty of Architecture at the University of Manitoba on 21 October 2001.

How, at the beginning of a new century, might architecture progress from the fashion- and economics-driven art form that it is to something else, something better? What resources ought we to be using? Should architects learn from other disciplines--even join with other fields, such as psychology or geography? Or should architects remain within architecture, reaching out to other disciplines only now and again? What I've found over the years is that you cannot simply search out "results" from research in other disciplines and then apply them to the problems and aims of architectural design. Economists can't design, nor can sociologists, ecologists, or most engineers, since they do not have the same mindsets, skills, questions, or agendas that architects do. And the data they produce is not easily incorporated. If, on the other hand, you completely enter one of the other disciplines yourself--which takes a good few years--or if you come from one of the other disciplines to architecture, the very learning of the second discipline tends to eclipse the first. There's so much to know.

In the late modern age it's rare to find the functional amalgamation of two or more distinct disciplines in a single person.

The approach I think we should be using is this: an architect should start in architecture and end in architecture, and remain at heart an architect, but make one or more extended journeys into other disciplines, journeys that might last a period of years. These journeys into art, or ecology, or engineering, say, are less like tours from which one brings back interesting souvenirs, and more like living with the natives for a while, speaking their language, getting excited about what they get excited about, and coming home before it's too late. This *modus operandi*, it seems to me, is the best way of keeping our questioning distinctly architectural while at the same time learning other ways of seeing and acting in the world. Not everyone can or should embark on this course; it ought to be reserved for only those who think there could be more to architecture than what meets the eye (and more to it, too, than constructional ingenuity), only those who have the time and institutional support this course requires. Let me relay to you some of the enthusiasms I have picked up from just such extended intellectual visits. Each, I think, could contribute to the task of thinking about architecture in new ways and thus taking it forward. Only time will tell if I am right. I will touch on four topics.

The man who inspired me on the first topic--complexity theory and evolution--is Louis Kahn. He loved science more than fairy tales; and, although he did beautiful buildings, he thought architecture's deepest impulses were ethical, not aesthetic. At the chalkboard, with both hands at the same time, he drew beautiful sequences, starting with something simple and filling it in with life, lapping the borders. When Louis Kahn drew that kind of pattern, he was expressing something very deep about how life evolves and elaborates itself, not only in nature but through man. Indeed, if you look at any of Kahn's many metaphysical diagrams, you see him trying to say where architecture "comes from." It comes, he said, from turning silence into life, darkness into light, potential into joy. What a life-affirming way to think of architecture, and indeed about any creative endeavour involving conscious design! Life affirmation is an ethical principle, as is the idea that life is intrinsically complex and becoming more so as it "fills itself in."

This is an idea that I have tried to work out in my own way by voyaging into complexity theory. The claim this theory makes is that the right combination of higher complexity and a higher organization is what life "wants," and that right combination is characterizable by a variable dependent on complexity and organization, called *omega*. In the story of evolution, all species try to "travel up," to find viability higher up the complexity ridge than their parent species did. Why? Living things create each other's environment. As they multiply in number and get in each other's way and compete (both with each other and with other species), the world becomes more complex for all and more demanding of organization. At the same time, however, there is, along with the *omega* ridge, one kind of trench that we can call "the trench of rigidity"--all organization, no complexity--and another

kind of trench that we can call "the trench of chaos"--all complexity, no organization. Everything that is alive is travelling or "tr ying" to travel up and as far away as it can get away from both of these trenches--which is not an easy matter. The second law of thermodynamics (which says, basically, that every isolated system slowly "goes to hell," to chaos), can be represented as a clockwise "wind" of sorts that is trying to blow creatures down into the trench of chaos. The opposite danger is ossification, which can happen when internal energy levels drop too low, or order is imposed from without.

According to psychologist Mihaly Csikszentmihalyi, what makes us happy (aside from eating when we're hungry, winning the lottery, and the like) is being in a state of flow. People feel best, he says, and people operate best, when they are in a state of flow (or "in the flow channel"), which is to say, when the challenge (task complexity) is equal to their skill (task organization). If the degree of challenge exceeds one's skills, one feels anxious; if one's skills exceed the degree of challenge, one feels bored. But right in the middle (it's a kind of Goldilocks theory too) you feel just right. When in a flow state, time flies like a banana (thank you, Groucho); work doesn't feel like work. You feel happy, competent, neither over- nor under-extended. The feeling of flow is the feeling of long-term viability ("I could do this forever!"), which is how the larger pattern of evolution makes itself felt. With experience and with learning, both the level of challenge we want and the level of skill we achieve increase--matching each other in degree--to come to rest (for a while) at a higher level: greater omega, more life.

Let me take this thinking to architecture, something that can be done in many ways, of which I will mention two. The first point is that what we all call "design," the mental process, is actually evolution speeded up. It's a way of taking a mind, a brain, and making evolution run faster in model form. After all, in designing, we reiterate the three essential processes of evolution, that is, reproduction with inheritance, variation, and selection; we generate options, test them, reject them, draw them again a little differently, do it again. This is evolution, at an accelerated rate, of the virtual objects of our imagination. Then we build prototypes and test them. The process itself increases both the complexity and organization of the thing being designed, and the complexity and organization of the mind of the designer as well, especially if he or she feels flow. The practice of design is itself passed down through the generations, and it evolves. Through design, humans, individually, and cultures as a whole, have found a way to speed up the evolution of the artifacts essential to enriching and extending life. Design adds value, we might say, because "value" is what we attribute to anything that enriches and extends our lives. The second point is this: evolutionary processes are uniquely capable of generating copious amounts of organized complexity. Deliberately moving an evolved artifact, process, or organism off or down the ridge is anti-life, and that is why greater simplicity can never be a good thing if it is combined with less organization. Indeed, I would say the love of simplicity-and-disorganization is the root of all evil. If this is true, and I think it is, we should be wary of all kinds of fundamentalisms, religious or architectural, because they advocate movement toward greater simplicity on the one hand (e.g., fewer elements in play, fewer alternatives, and with stronger preferences upon them) and more disorganization on the other (e.g., absent, more lax, less precise, or more arbitrary application of rules in practice, qualities often misrepresented as "freedom").

Certainly, any evolutionary theory of design should give us a much higher tolerance for complexity in architecture, as long as it is concomitantly organized complexity. The thrust of life--and therefore of design, we should realize--is toward richness, toward the Baroque and not the Diagram, the peacock and not the cage. Venturi was on to something. "Back-to-basics!" is a cry we should not long to hear. It means something has gone awry. Nor, too often, should we hear that this or that feature of our design "doesn't matter," that it's "unnecessary" or a "frill." Nature gets her frills any way she can. So should we.

In *Towards a New Architecture*, Le Corbusier tells us that the best architecture is made up of basic forms brought magnificently together in light. You have architects like Aldo Rossi taking that to heart, and all sorts of reductive and simple versions of architecture following Le Corbusier's dictum to this very day. I might also have used Mies as an example. But when I see a picture of Le Corbusier's cabin at Cap Martin, where he went when he got tired of his own buildings, I realize that he was not just an iconic designer with a penchant for the big picture, but a real and life-loving person. Look at that marvellous ancient tree; look at the rustic log walls of the cabin he designed; the gingham cloth on that table where he lunches with his wife, the crooked trelliswork. Think of the ocean roaring nearby, the gulls. When it really came down to showing us what architecture ought to be like, this is as good an example as any of what evolved complexity in a place can give

you. Le Corbusier should have put photos of this in *Towards a New Architecture*, rather than pictures of silos.

Architects need to find ways to embrace complexity, to embrace age, and to embrace other life forms, from living animals and plants to natural, renewable materials, in order to give their architecture at least some of the organized complexity of nature. This is what our souls want. It is also the most ethical direction for building to go in right now, and that, in turn, makes me unhappy about the predilection many young architects have for brutal if stylish minimalism of the Dutch or Swiss kind. The sometime sublimity of these inhabitable diagrams--so easy to draw in CAD and build--could entice the whole field into another round of de-evolution toward over- or under-organized simplicity, Modernism itself having been the first. Design is partner to evolution. Greater complexity, not less, is its natural goal: complexity organized but not too, at all scales, and yielding more life.

I would like to comment on a few things I learned from another discipline I spent some time with: economics, the science of markets, my second topic. It is the study of exchange involving money and "goods," where the goods in question might be material things, energy, knowledge, information, work, time, or money itself in some other package or form. In all of this, economics casts one party as the seller and the other as the buyer. Often the first is also a producer; usually the second is also a consumer. Then there are brokers, agents, regulators, and so on. We are all familiar with these terms.

Now, markets have only a short history of being thought of in evolutionary terms. Certainly marketplaces grow, and when they do grow large enough they produce a degree of social organization and social complexity that no one can fully understand, not even economists. When millions upon millions of people at the same time work, want pay, make, invest, swap, bet, risk, borrow, insure, hedge--and are connected to each other world-wide, and especially when money can flow anywhere in a twinkling--the market becomes a global force, a quasi-living thing in its own right, a thing that no one can control. Whole new phenomena emerge, spilling over into politics and art and science, literature, into every human endeavour.

As architects, we do not typically think of economics as a creative discipline or as something we could learn from. We don't teach economics at architecture school. This is a pity, and not just for practical reasons. Reading economic philosophers like Adam Smith, Karl Menger, William Jevons, Karl Marx, J.M. Keynes, Vilfredo Pareto, Friedrich von Hayek, John Kenneth Galbraith, even Paul Samuelson, is a great pleasure. How ardently they grapple with human beings' dual desire to profit and to do good; and what a charming combination of rhetoric and mathematics, of speculation and observation, they develop to model what happens when thousands of individuals act to realize these dual ambitions, partially independently, partially in imitation of each other, partially bound by the rules of changing social and technological regimes. For architects, however, "economics" enters our professional milieu mainly as a spoiler of dreams. Anything good or interesting we propose to build is sure to cost more than anyone wants to pay, including ourselves. That's economics, according to architects. Thus does The Budget enter as the bully player, the nay-sayer, the invisible Force that stalks the office. To keep our sanity (not to mention our self-respect), we have persuaded ourselves that we can be just as creative with small budgets (per square foot) as we can with be with large ones, in fact, more creative, because we have to be. But that's a kind of denial of the truth, painful as it is, that quality costs time and money.

I became interested, therefore, in whether and how certain well-known mechanisms of the marketplace could be ju-jitsued into allowing architects a little more freedom, putting more money into their buildings and into their pockets. One quickly comes to see that no belief circulating among architects today is more self-destructive than the belief in the power of creativity to conquer cheapness. Frequently, the scenario is this: a client comes in and says "I want you to do this, this, and that for \$100 per square foot." Far too little. What does the architect say? "No problem. I'm creative. I'll get right to work." The client knows, and you know, that the price is going to go up as the project unfolds. Just how much, is the question. This is basically a bad-faith agreement at the start, with both parties trying to "psyche the other out." But, with architects, there is a twist. As an artist and professional, you are trying to move up what you offer, to make a progressive move. And you are (probably) more interested in total quality than the client is. He or she, on the other hand, is trying to pull you down, to reduce costs and eliminate unnecessary quality, especially if its benefits are to be felt by passersby or others who won't pay. The result is diametrically opposed vectors. Stalemate? Not usually, because operating in their favour is Gresham's Law: "Bad money

drives out good money."

Any long-stable market price (for a certain good) can then be thought of as a stalemate, a tug of war with no motion, between what the producer/sellers would prefer and what the consumer/buyers would prefer. Actually, this sort of stability is rare in non-commodity goods. ("Commodities" are goods that are standard in quality no matter who makes them, like sugar, salt, gasoline, lumber.) As soon as we introduce novelty, technological progress, artistic judgement, fashion, perceived or real shortages, and so on, the price-quality stalemate is undone. Goods start sliding around in the correlation space of price and quality, pulled hither and thither. Opinions fly; justifications are offered. There's introductory and predatory pricing, reputation exploitation. Competition abounds. In these circumstances, can there be any real progress? You pull this way, I pull that; we come to an agreement as to price, and that's it. Yet, progress can be made in an absolute sense. I would claim that both price and quality, especially quality, represent complexity and organization. Goods evolve, and when they do, they get better. Markets evolve, and when they do, the costs of things traded in them drifts upward, too, as more bits, more internal markets and longer supply chains, form. When a whole class of products improves, becomes more complex and more organized, the drift of the entire leaf is up and to the right. More people are able to pay more money for better quality. How are they able to do that? Because they are richer. Why are they richer? Because the goods and services they produce fetch higher prices, too, because they're better. And so on, round after round, as more energy and intelligence are applied to satisfying more people's needs more completely. This is not inflation, which is what happens when governments put more money into circulation than is warranted by production-, employment-, and quality-levels. This is economic evolution, and it's been happening for thousands of years.

I paint a rosy picture: good over the long term. In the short term, however, other dances are danced in the correlation space of price and quality. Say a new business comes on to the market; a new restaurant opens or a new car is introduced. What do producers/sellers offer? Relatively high quality for an obviously low price: the consumer's dream. But, as time goes by, the producer/seller slowly causes the product to drift toward a position he or she is happier with, which is to say, high price and low quality. This is doable in part because, with success, per-unit average production costs can come down. "Economies of scale" is the name economists give this phenomenon, and it allows producers to maintain or lower their prices while maintaining or increasing their profits. In this scenario, quality need not suffer, although it often does, especially with relatively low-tech goods. But people are much better at noticing price differences than they are at detecting quality differences. The latter requires connoisseurship, vigilance, and immunity from the reputation of the producer. Exploiting their good reputation, producers can lower production costs by cutting corners, hollowing things out, skimping on services and warranties, using cheaper materials that look the same, and so forth. Such goods, in the minds of their consumers, come to occupy what I have called the phantom position. Eventually that position evaporates, of course, as the truth becomes known and as a competing products start their cycle with the same or better product at a lower price. But in the meantime, much money can be made.

Why should architects worry about this process? As producers in competition with each other, and as people unusually anxious to please, we often find ourselves following this pattern, including, occasionally, the exploitation of reputation. The Earl of Gresham was finance minister to Queen Elizabeth I, around 1650. What he noticed was that when you introduce coinage into circulation that has a lower metallic value than the coinage currently in circulation but that has the same face value--if you mint silver dollar coins while gold dollar coins are also in circulation, and gold per ounce is more valuable than silver per ounce--people stop using the gold coins as money and melt them down instead to get more silver ones. Or they simply hoard the gold coins as their price (in silver dollars) goes higher. Sooner or later, brass dollars replace silver ones, paper money replaces brass money, digital money replaces paper money, and so forth. That's because money, to be money, need have no quality beyond inducing other people to trust that yet other people will give them goods in proportion to its face value. Money's true form, as it were, is to be no more than a digital wink.

Gresham's Law is not just about "bad money" driving out "good money," which is why I bring it up. It is also about understanding that not every property or quality of a thing we make is equally valued by the person receiving it (if it has any value at all). And it is the clever producer who is able to capitalize on this fact by redesigning the good so that only the things people notice and want in the good are, in fact, manufactured. One can either "close down" on the object until it is exactly what people want, and only what they want, jettisoning all the superfluous stuff, simplifying and organizing; or, and this is potentially the more evolutionary road, one can increase people's

appreciation of the object as it is in full; one can increase the complexity of the object and of people's valuation of that complexity. Gresham's Law will always take you down the first and lower road.

Why should we care? Well, if you look at the percentage of Gross Domestic Product (GDP) in the United States that architecture (i.e., non-residential, non-military construction) represents as a fraction of the whole GDP, it has been dropping steadily since 1965. (There are actually data that show that it has been dropping steadily since the 1930s.) Maybe we are building less? Wrong: we are building more each year. Statistics show that, as America grows wealthier and wealthier (the GDP has been going up in absolute terms, as if you were getting a raise every year), a smaller and smaller fraction of its wealth is being devoted to the creation of architecture, or the creation of buildings in general, in the same amount. When you start spending less and less of your income on something, this is the surest sign that something is losing value to you. This is Gresham's Law at work. If people can't see the difference between a good building and a bad building, they're slowly but surely going to get worse buildings. If they can't tell the difference between expensive and cheap, they're going to get cheap. And architects who whip themselves to be more creative, who stay up nights to find cheaper ways to make cool-looking buildings, are only going to make the line representing percentage of GDP per square foot of architecture drop further faster.

This is not a future we should have to live with, or get used to. It's a dead end, a prison. Architects have to fight back, and the only way to do so as far as I can tell is to stop talking about simplicity with such reverence (e.g., as "the soul of Modern Design") and start talking about complexity, about life and its richness, and how much needs to be done. There's more to this than preferring the Baroque. To revive architecture's value, we need to identify publicly and quite specifically which human needs architecture serves and how it does so. The task is to explain the goodness of (good) architecture to ordinary people in such a way that they will be willing to pay for its finer points, even if indirectly. This requires us to be knowledgeable and clear in communicating architecture's many subtle qualities, and it requires that we never become reductive, essentializing, or diagrammatic about it. People want reasons to value what they value. If we don't supply them, who will?

Most of you who have had any contact with academic architectural theory over that last twenty-five years or so know that there is a genre of it that really has very little to do with human life or human needs, with what people want or what people value. It is theory totally internal to the discipline, and very much based in history, specifically the history of modernism. To my mind, this theory is a prime example of architecture shooting itself in the foot. Architecture has the potential for being one of the greatest wealth generators of the twenty-first century. Given the "dot-com" bust and the telecom bust, I think that architecture (and environmental design generally, from interiors to landscape) stands poised to become a major driver of national economies: a new centre of investment, innovation, appreciation, and quality-of-life increase for all. And I don't mean just "housing." But, for that to happen, we are going to have to recast what architecture is and what architecture does in terms that are both understandable to ordinary educated people and provocative to us from an intellectual point of view. I am not asking us all to drop our intelligence and start talking to the masses, tabloid style. I am saying, however, that, just as psychology has generated some extremely complex and difficult theory that both keeps academics busy and interests ordinary people, so too can architecture sustain interesting, difficult, and challenging academic theory whose aim is to explore the architectural phenomenon in terms whose outcomes will help produce buildings and experiences that non-architects will appreciate, profitably study, and, most importantly, want more of. This is what I will discuss briefly under my third topic: the psychology of human needs.

The right way to begin developing the architectural theory I refer to is by questioning what human needs are. Not everything one feels like having or experiencing is, itself a need, although it may be motivated by a genuine need. Needs run deeper than wants and preferences, and they are fewer in number. Let us grant this. On the other hand, to cut all needs down to one essential need--the need to survive, say--is overly reductive. Somewhere between one basic, urgent need and the five hundred momentary desires we feel every day, lies a useful number of discreet, genuinely basic needs, five or six of them, say, that we all feel, and the satisfaction of which underlies the myriad smaller things we just want, things that are more or less substitutable for each other. Searching the literature of motivational psychology for the most useful list of basic needs, I came across Abraham Maslow's well-known "hierarchy of needs," first proposed in 1954. As I carried on my own work, I had to expand his list of five needs to six: survival, security, legitimacy, approval, confidence, and freedom. I often display this as a vertical list, with survival at the bottom and freedom at the top;

the implication is that the needs form a hierarchy, although I prefer to call it a stratigraphy. What this means is that needs at the bottom, that is, the "lower needs," are more basic and intrinsically more urgent than the ones at the top. An unsatisfied lower need will usually motivate you to do something about it before an equally unsatisfied higher need will. You cannot move up the stratigraphy without first consolidating something at the lower levels. Each need is foundational to the one above. Each emerges from the one below, once that is substantially satisfied. With every step up the stratigraphy, things become more complicated; the physical, social, and psychological arrangements that must be made become more numerous and subtle. One might identify freedom that is based on the substantial (if not perfect) satisfaction of all the lower needs as well-founded freedom. By contrast, one can have poorly founded freedom, that is, some degree of freedom without one's lower needs being adequately satisfied. So fragile is this freedom that threats to it are likely to be met with coercion of some sort.

One of the ways to parse the stratigraphy is to divide it formally into two groups of needs: the lower needs--survival, security, and legitimacy--and the higher ones--approval, confidence, and freedom. This is a useful division in several contexts. For example, it can give you a handy criterion for distinguishing between coercion and persuasion. If you are exchanging goods or tokens with someone such that the consequences of the trade involve increments or decrements to their lower needs, you're probably using coercion, that is, using violence, power, or authority to try to get your way. If, on the other hand, the consequences of your interchange involve changes in the satisfaction level of one or more of one's higher needs, then the interchange is likely fueled by persuasion; one or both of you is using flattery, encouragement, or, the gentlest of all persuasive strategies, your own example. The logic underlying all of this is a simple moral rule. This rule says that, when dealing with others to obtain some objective, use minimum force or, what is the same thing, start at the top of the stratigraphy. The way to get people to do things is, first of all by your own example or by pointing to others; if that doesn't work, try encouragement; if that doesn't work, try flattery and insult; if that doesn't work, use authority; if that doesn't work, use power and, after that, violence. Upon introduction, and for as long as possible, interact with people at the level of their highest needs before interacting with them through their lower ones (if you need to at all). Like the presumption of innocence in law, this honours the individual as a person of accomplishment enjoying well-founded freedom. Says the rule, in sum: prefer persuasion to coercion, and higher forms of each to lower ones. Happiness is what we feel with every increase in our total satisfaction, which is progress to well-founded freedom. Sadness or sorrow is what we feel with our satisfaction's decrease, for we know it is on the way to consuming worry about survival.

Take the lowest two needs together: survival and security. The first architecture consists of the arms of a parent. Furniture follows--the cradle, the bed--then architecture proper: walls, roof, room. The most fundamental *raison d'etre* for buildings has always been to provide shelter, from heat and cold, wind and rain, projectiles, dirt, poisons, weeds, insects, other animals. Although architecture's function is rooted in this realm, the satisfaction of survival and security needs continues to be provided by better architecture in more subtle ways. Cleanliness, for example, is vital for health, and so are light and fresh air. When you visit a place that looks and feels clean, the pleasure you feel is actually derived from the human need to survive. No disease here, says our unconscious. Similarly, the comfort of chairs, beds, sofas, and so on is no empty luxury. It, too, goes back to our basic needs for survival and security. After all, discomfort is prelude to pain, and pain is part of the body's early-warning system, a signal that death could be imminent if whatever is causing the pain gets its way. The sound of laughter and the sight of happy animals are comforting in their own way. No danger here.

When we suddenly realize that our buildings are fragile, that there are circumstances under which we simply could not trust this roof, this ceiling, and these columns to stay put, the whole complex of attitudes we have toward architecture stands both revealed and reduced. Think of how the events of September 11, 2001, have re-ranked our need for security. In peaceful times, architects love to tease our need for security, to provide for it (as they must) while seeming not to. I refer here to tilted walls, high catwalks, long cantilevers, thin slabs, sheer glass, immense heights, open approaches, indoor-outdoor continuity, and so on. Indeed, elegant fragility in construction, together with absurdly open plans, becomes an indicator--a sign, a "proof"--of peace's rule in the neighbourhood, as does the obvious neglect of measures that protect us from violence, such as high walls, gates, and locks. These factors indicate why the wealthy are often attracted to the minimalist modern style: it's what they can apparently do without, architecturally, that signals what they have by other means, for example, by law, friends, noble character, or invisible high technology.

The next two lower needs are legitimacy and approval. We are who we are because of where we are. Identity is, in part, spatial because the company we keep follows the rules of propinquity. Buildings give us addresses, places to be and to be found according to our social roles and positions. Consider the social status of the homeless. Consider, too, that, after land, buildings constitute the very basis for property rights, without which economic life would not be able to evolve past subsistence levels and without which democracy could not flourish. Moreover, property lines define trespass, and trespass defines privacy, upon which a great deal rests. All of this spills over into the approval we show each other and the friendships that result. That we can be "at" a university or school or meeting place by virtue of citizenship and membership is marvellous. The social bonds that form around our seminar tables, board rooms, classrooms, dining rooms, playing fields, and so forth are as ancient as they are important to satisfying our need for friends and associates in life. Architecture stands at the very nexus of all "coming" and "going," just as control over our own visibility (and audibility) via architecture stands at the very nexus of social cohesion at all scales, family to polis. And then there are the approvals we must get from neighbours and community boards before we build, and the admiration we get afterward, for being responsible for fine architecture.

How does architecture give us freedom? If you make money from architecture--designing, teaching, building, renting or selling it--then much of the freedom you get from architecture is contained in cold, hard cash, cash with which you can do anything you want. "Money is coined liberty," wrote Dostoevsky. But so is space, and so is time: space enough to move, time enough to think. Architecture clears space and time for us by virtue of how it excludes and holds back the forces that would otherwise take us over. For me, Pablo Picasso stands as the model of a confident, well-foundedly free and creative person. Picasso was no saint, to be sure, but he worked as hard as he played. He loved and was loved by many; he accomplished a great deal during in his own lifetime. No wonder he has been photographed dancing in the spacious studio of his villa on the Mediterranean, not far, one imagines, from Le Corbusier's Spartan cabin.

Finally, let me show you a little-known building by a well-known contemporary architect that is emblematic of what I am trying to convey: a "video pavilion" in Groningen by Bernard Tschumi. Here, everything that you would expect from a building in terms of its ability to shelter, protect, and so forth has been provocatively deconstructed. The floor is metal at a slippery tilt; the walls are glass, no mullions; and the roof is glass too. Moldings: none. Vulnerability to bad weather: 100 percent. Air circulation: minimal. Exposure to view: 100 percent. Remember the old saw about people who live in glass houses? Here is a fragile building, beautifully crafted, prim and yet playful in its tilt and hide-and-seek games of transparency and reflections, placed into the public realm where lovers share blankets and dogs chase balls, but placed rather seriously nonetheless, as both fruit and demonstration of a civilization at peace, rich in technology, endorsing a (then) new art form.

My fourth topic is phenomenology. What is phenomenology besides a big word? Most simply, it means "taking appearances seriously." This, in turn, means trusting one's senses. It means spending more time looking at and listening to the world in all its detail and subtlety and less time speculating about the big picture and how it "basically" works. Phenomenology, so understood, is a tonic for scientists as well as poets. I want to conclude by suggesting that it is also good for architects, those who are too often in a hurry to turn their rudimentary diagrams into large buildings.

Perhaps the best way to make this point is to refer to a seminar I taught entitled The Art and Science of Architectural Phenomena. In this course, students were asked to treat buildings as extremely information-rich things, full of subtle facts and effects. Blurring the line between art projects and science demonstrations, we become "pathologically" interested, say, in how doors feel when they open and close. (This has to do with their weight, with the shape of the strike plate and the contour of the tongue of the lock, on the fit of door to the frame when closed, on the damping quality of the wall, and a dozen other things too.) Or we watch how a single window illuminates a room through the day and in different weathers and seasons, treating that mathematically and photographically. One student in this seminar became interested in the phenomenon of changing eye levels. To make his point in a simple but powerful way, he carried a ladder around our school of architecture and took interior photographs from roughly two feet below the ceiling. Scale effects aside, these pictures were uncanny. We hardly recognized rooms we had used a hundred times. Their tonality was altered completely. If you've ever painted the ceiling of a familiar room you'll know what I mean. Another student undertook a study of the possibility of a roof of water. This student built a very elaborate apparatus that suspended a cubic foot of water about four feet off the ground. He then shot sixteen-millimetre movies looking up through it at the day (and night) sky.

Dropped leaves and detritus, and random wind and structural vibrations produced, from below, some extraordinarily beautiful patterns of refraction, feelings of immersion, and perceptions of altered gravity. No aquarium this, but a liquid sky. Another student set out to find better and more vivid ways of representing isovists. The idea of the isovist is to map very carefully the limits of your vision in any space. After all, around any point in architectural space, there is a finite volume of space that you can see and from which you can be seen. That volume is called the isovist. The student's idea was to find better and more vivid ways of representing isovists by using sight and sound and a fast computer. The results were fascinating, as were so many others in that seminar.

As a final point, I ask you to consider a certain visual phenomenon I first noticed in Mexico, in a small colonial town called San Miguel de Allende. This is a town where, if you take your camera and shoot more or less at random, all the shots will turn out to be great. I wondered why, since the buildings are not that great in themselves. Slowly, I began to understand that San Miguel is a town in which the interplay between light and shade is very intricate, organized, and complex. Every photograph shows moments of brilliant contrast, as things in sun are seen in front of things in shade, and, only a few feet away, vice versa. I became preoccupied, not so much with the sun or with the shade but with the "scientific" fact that whenever the sun is shining, there are invisible planes and boundaries that separate sunlit volumes from shaded volumes of space. For example, if a bird were to fly through them, the bird would go from grey to white to grey to white as it penetrated those boundaries between sun and shade. If only I could see those boundaries, those volumes, I could compose and design with them directly. In San Miguel, I realized, the streets are of such a width that, for most of the year, the boundary between sun and shade occurs exactly where people are walking about, active. And that is why one often sees people whose upper bodies are sunlit and whose lower bodies are in shade, or whose upper bodies are in shade and whose lower bodies are sunlit, and this against backgrounds of exactly the opposite register. To design a building so as to maximize the number of boundary events between sun and shade throughout the year, I realized, one would have to use the "design angle" peculiar to the specific latitude, and the specific solar altitude, in which the building is located. One student in our seminar took this issue up as the theme of his master's thesis, a thesis that concerned the design of an open-air market in Beijing. He began by using volumes of sunshine as the actual objects of design, separating them out from each other so as to maximize their surface area. He came up with some rather ravishing representations of the basic shell of the market, a shell designed by using sun/shade boundary optimizations. In that seminar, we were architects trying to look and to listen--in a phenomenological way (see Plate 15, colour section).

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