Jay Randle

Theory, that which is called theory, and practice.

A couple of decades ago I came across a breezy piece of interpretive journalism. I've lost track of the source and as literary explanation it's too simplistic to merit much attention. Nevertheless, the image it evokes is useful to situate these remarks vis á vis the landscape of contemporary theory:

Novelists during the past 20 years have been so busy making up the truth that they have not had much time for fiction. The names of Norman Mailer and Truman Capote spring immediately to mind, along with their catchy formulations "nonfiction novel" and "the novel as history." Mailer, nurtured on emanations from Marx, Freud, Kierkegaard and Wilhelm Reich, can be an inspired explainer of the modern cloven spirit. Capote, the old Southern boy, steeped in regionalism and the oral tradition, is the storyteller, the Mother Goose of U.S. writing.

This is no mean designation, but since critics are explainers, not storytellers, Mailer is usually perceived as a heavyweight and Capote as a lightweight...

I teach. Studio mostly. Studios at the foundations of Architecture. My discursive, explanatory efforts must motivate and guide the uncertain practices of novices. My tutelage must enable action without circumscribing each student's unique potential to develop. I tell stories.

Story, projection, and parable work for us; they make everyday life possible; they are the root of human thought. Story as a mental activity is constant, yet unnoticed, and more important than any particular story.

The basic stories we know best are small stories of events in space: The wind blows clouds through the sky, a child throws a rock, a mother pours milk into a glass. These, and similar stories, constitute our world and they are completely absorbing — we cannot resist attending to them. Experience revolves around pouring the drink into the cup, watching the bird soar, the plane descend, tracking the small stick as the stream carries it away.

We understand experience in this way because we are built to distinguish objects and events and combine them in small spatial stories at human scale in ways that are useful for us. [Mark Turner]

So, whether you be explainer or storyteller, I intend today to tell you a few selected stories. Stories that have a trajectory and a target. Parables. Later you can decide about their weight.

A Delineation of Limits

Our session theme invites us to discuss the possibilities for an interface between theory and practice as these terms relate to architecture.

Interface implies a region of contact between two domains, a region necessarily more limited than either domain taken in its entirety. Thus we are not concerned with the whole of theory, nor yet with the whole of practice, but with that subset of each where their respective boundaries touch or interpenetrate each other, and across which some interchange or transaction may occur.

What is called theory runs a gamut. The varying senses the word carries in common, everyday usage attests to this. Some are honorific, some pejorative, some precise, and others vague.
To give an indication of the range, consider the following taken from a popular Oxford Dictionary of the English language:

theory (n) 1 Supposition or system of ideas explaining something, especially one based on general principles independent of the particular things to be explained.
2 Speculative (especially fanciful) view. 3 Abstract knowledge or speculative thought (all very well in theory). 4 Exposition of the principles of a subject. 5 Collection of propositions to illustrate the principles of a subject.

The varied services into which theory may be pressed covers a similarly broad range: speculation (mathematics, string theory in physics), explanation (music), direction or guidance (sociology, economics), accommodation (psychotherapy, for instance, or theology when viewed from a Marxist perspective — neither means to fix anything exactly, but their respective mythologies help one adjust to one's neuroses), exhortation (choose from your favorite ideologue's manifesto). Theory can extend, recenter, or renew a domain, help it recover from excess, break out of habit, entertain, or simply afford the theoretician a livelihood, though under those circumstances Montesquieu warned us it is difficult to think nobly. Theory can serve to justify past actions, or to amend and redirect subsequent undertakings. That which is called theory can also construct an imaginary realm of seductive vagueness into which one escapes to avoid confrontation with the concrete.

Possibilities of health

Consider a few phrases from Italo Calvino's undelivered Norton lectures, Six Memos for the Next Millennium, the one he titled "Exactitude":

It sometimes seems to me that a pestilence has struck the human race in its most distinctive faculty—that is, the use of words. It is a plague afflicting language, revealing itself as a loss of cognition and immediacy, an automatism that tends to level out all expression into the most generic, anonymous, and abstract formulas, to dilute meanings, to blunt the edge of expressiveness, extinguishing the spark that shoots out from the collision of words and new circumstances.

At this point, I don't wish to dwell on the possible sources of this epidemic, whether they are to be sought in politics, ideology, bureaucratic uniformity, the monotony of mass media, or the way the schools dispense the culture of the mediocre. What interests me are the possibilities of health.

What interests me, also, are the possibilities of health, as theory and architectural education and practice inform one another. Rather than map all possible regions, or modes, or motives, or readings of interface, I will delineate the character of certain kinds of ideas that can (i.e., that have the capacity to) establish an interface with practice, discuss several particular instances of theory and practice fruitfully interrelated, offer a brief explanation of why I think these instances are productive, and leave to others the consideration of other forms of theory and other interpretations of what interface might mean.

When a given content is taken up in our attention in a particular (i.e., in an analytical) way, we attend to it theoretically. When we formulate an explanatory account of what we have thus taken up, we theorize. But to theorize we must take up some content, not simply address as if they were content other formulated accounts. A deep concern for language and its potential motivated Calvino's remarks about "...a plague afflicting language, revealing itself as a loss of cognition and immediacy... extinguishing the spark that shoots out from the collision of words and new circumstances."
We should heed it as a warning about an urgent dependency, the need words have for new and authentic circumstances if thought is not to be extinguished. In our context, it is a warning about the need architectural theory has for its own

distinctive content, a need for the world of architecture itself. We in the academies have allowed — no, encouraged — our theory to lapse into theories about theories about outmoded theories from other disciplines, disciplines whose own distinctive content and problems we do not know, and within which the theories we have borrowed no longer carry weight.

Crows are famed for theft; they hoard small, glittery things in their large, untidy nests, things of no crowish value save for a presumed appeal to the unfathomable limbic brain — an earring, a bottlecap, a discarded foil wrapper, a watch (do crows tell time?) — precursors to the human love of ornament, some think. Also famed for raiding farmers' fields, crows shrewdly distinguish between vital value and infatuation, preferring corn to watches when they feed. Would we were as wise.

Why we theorize

Impulsions to understand arise *in medias res*, in the middle of things. Explainers, storytellers, and small children prefer to begin at the beginning. Only in myth, or fiction, or in such formally decidable disciplines as mathematics can one ever hope to establish one's discourse in such a fundamental place. For the rest, these predilections are understandable but vain [Fig. 1], the frequent butt of Larson's humor. [Fig. 2] We can't be there at the beginning. If we could, the nature of the inchoate would mean that what concerns us would not yet be formed, or that the very sensibilities by means of which to notice it would be dimmed below awareness. We could neither cognize nor recognize what had not yet have come into being.

An apocryphal story about an aspiring French dramatist illustrates the point. His first (and last) play concerned a young doctor who returns home from a maternity house call late one night, exhausted but elated. At this point plot, dialogue, and literary career go irretrievably astray, as he makes the doctor exclaim, "You'll never believe who I delivered tonight! Victor Hugo!"

Sadly, therefore, Laugier's charming Primitive Hut belongs in the same repository of intellectual curiosities as Rousseau's Noble Savage, or Hobbes' darker vision of man in a state of Nature, where life was "nasty, brutish, and short".

1

Grog Schwartz eats some bad beetle grub and the art of dance is born.

2

Theorizing is integral to inquiry. Together the pair displays a natural history, follows a genetic, which is to say a developmental trajectory. Inquiry begins in the middle of things, as a dawning awareness of something problematic in experience. Dewey situated the origins of inquiry in the existential ground of vital uncertainty—not the semblance of doubt as Descartes used it—something closer in spirit to Kierkegaard, though less angst-ridden.

Inquiry seeks to articulate that which forms the ground of our uncertainty and thereon posits a beginning. What we encounter as inchoate, inquiry treats as formful, receptive to form, and finds form for it. Inquiry seeks to make explicit that which we apprehend as tacit. The imperative of inquiry is to extract clear principle from messy circumstance.

The existential, organismic ground of being

As perceiving and conceiving beings we are creatures of our habitat, writ large in space and time. Nature made us, and made us in Her image. We became over millions of years, fashioned from ancient and recycled parts, with some few novel elements thrown in. Each element of our being has a tie to the setting in which it arose. Our sentience is built in and localized.

From birth we have been hard at the job of making sense of our surrounds, with variable success. Our world is a Tower of Babel, addressing us in many tongues. We listen to few, understand less. Dogs hear sounds we cannot. Moths detect scent with more acuity than we see. We will never perceive space like the barnswallow, or warmth like the rattlesnake. Vision cannot detect the full spectrum of electromagnetic wavelengths. The lens and retina of the eye have built-in limits of sensitivity and resolution; hawk's eyes are more acute.

The abbreviated world we do confront still overwhelms. How we move from such confusion to a stable, ordered world — one in which we can function — largely remains a mystery, but these few things are clear:

First, perception is not passive. We reach out, make sense of things.

Second, from our earliest moments, we treat our partial, local world as whole.

Third, the world holds meaning at many scales, grasped directly by sense and imagination, linked extravagantly by parable.

Both genes and culture encourage us to respond quickly and decisively to emergent events, to recognize — and act on — things that loom, and leap, and lurk . One could say that we are hard-wired to see the world as instrument, an instrument that always works on, and sometimes is worked by us.

We attend to things as omens, as affordances, things addressed to us, meant for us, flowing into our future. We decide whether a storm is imminent, whether a field is fallow or abandoned, whether a building is going up or coming down, whether the person with whom we talk is trustworthy, whether the situation on the night street, or on the subway car, is threatening or benign, whether our spouse is vexed with us. We make most of these and similar decisions with ease. Our circumstances are drenched in quality, seized as quality, pondered and judged as quality, routinely, daily, continuously.

The means of perceiving and conceiving environmental quality, form, and character are embedded in an organismic history far older than architecture, than culture, than homo sapiens, than hominids, or primates. Our eye is the Vertebrate Eye, our nervous system and its basic organization too ancient for comprehension. A few centuries of professional pretension have not changed that biological substratum, nor have a few decades of increasingly more abstract architectural discourse.

Today, we architects are enveloped by emphatic testimony to our inability to think or feel environmentally. The design languages we constrain ourselves to employ were not designed to erase qualitative thought, nor was the move to frame our ideas ever more abstractly seen as a means to erase the capacity for it. As a species, even today, we have no problem using things or qualities to think. But as a profession we display such perverse intellectual and practical traits that one suspects a trained incapacity for sensible thought.

Without that qualitative mode of thought — our species' birthright — intact and richly differentiated, all efforts to think our way through complex and muddled circumstance to wholesome form and clarity must fail. The tapestries an architect must weave are in their essence spatial and physical. Verbal and temporal accounts — literary or discursive accounts — cannot constitute such forms.
The perjured testimony of Richard Rich finally brought Sir Thomas More to trial. Before the court Rich wrongfully attributed these damning words to More: "they [Parliament] have not the competence." The surface meaning of competence here is a simple one, technical and legal: the matter does not lie within their power. The deeper reading is the truly devastating ontological critique, for which More lost his head. When it comes to designing habitat, it seems *we no longer have the competence*. Worse yet, this trained incapacity seems the consequence of our academies, of our contemporary discourses in architecture. If so, *we should lose our heads for it.*

Dewey, speaking about the roots of intent, says, "...[A]ll deliberation, all conscious intent, grows out of things once performed organically through the interplay of natural energies...". This only describes the first half of a reciprocal equation. In design, conscious deliberation must reestablish a connection with an interplay of natural energies. Designs may be conceived (misconceived) as self-referential abstractions, yet they will become embodied. The natural history of form is a trajectory arising in sense, and — for all the theoretical conceits or imaginative incompetencies of the designer — returning to sense, where it may yet fail to make sense.

If all of the liberalizing and civilizing gist of an architectural education could be reduced to a single lesson, it would be this: Resist the retreat from Quality. Strive to see the given world, and the world we humans form, and the creatures who inhabit those worlds each with potential for more than we recognize in them, each with more than use, each with more than meaning (which at its worst is just another kind of use), each with the potential for Being.

A Conversation about World Views

The most direct window we can open on Design and Design Education consists of the stories we tell ourselves to explain or hold in memory salient features of the experiences we each have had. The ideas I present here are articulations of my experiences with the world of design — first as a student, then as a teacher, and throughout, intermittently, as an practitioner.

I think we can share with one another glimpses of what we each find that world to look like; I think we can learn to appreciate and respect the enlargement of our own experiences which another's represent. As the painter Robert Irwin remarked of other artists, and indeed of the general function of art, They take me down paths I would never have thought to travel. I hope to take you down a few you may not have thought to travel.

That which has been called theory in architecture has varied significantly in content, modality, and purpose during the past five decades, the scope of time which falls within my own experience.

When I left my parents' home to study at the School of Design, what you call Modernism held sway. Few could see its edges. As water is presumed to be for the fish, the modern was for us — our environing, invisible medium. It was not, then, a world-view. It simply was our world. This must now seem strange to contemporary ears, so accustomed to the Babel of conflicted pluralisms.

Just three contents in architecture were treated with theoretical attention, marked off as autonomous domains: first, architectural history (there is no other way to treat it — all history is an account of events only indirectly accessible to the historian who constructs it); second, that branch of physics which gives account of structural behavior, and; third, that branch of mathematics which codifies the means to describe extension with unambiguous precision. All other ideation, all other discourse about value and principle was subsumed within the studio. The Balinese once proudly declared, "We have no art. We do everything as well as we can." In the contemporary sense of theory, we had no theory. We did everything as well as we could.

History was treated (selectively, but usefully) as case studies in building morphology through time. While also set apart in its own self-sufficient course sequence, structures was speculative, pursued experimentally in the studios of teachers like Nowicki, Catalano, Candela, and Fuller. Descriptive geometry was distinctly Mongean , treated as *a system of ideas explaining something, especially one based on general principles independent of the particular things to be explained.*

This last was rare in my country. A mid-nineteenth century American writer on the subject had put it thus...

The subject of Descriptive Geometry, which is treated in these Elements, has not, as yet, been considered in this country as a necessary part either of a polite or practical education.... In France, Descriptive Geometry is an important element of a scientific education; it is taught in most of the public schools, and is considered indispensable to the Architect and Engineer.

...and a century later the general situation had not much changed. Our School's case was rare, a fortuity attributable to our professor, a brilliant young Frenchman and recent graduate of the Ecole des Beaux Arts, where Monge's legacy had remained intact.

The problematic entered our world as it always enters, at first unnoticed. In retrospect one can point to Gary Powers' downed U2 and Dwight Eisenhower's all too public lie, the triumphantly beeping sputnik and the US Navy's sputtering Vanguard rockets. There was the Day the Music Died, and the Bay of Pigs, and the Thirteen Days of the Cuban Missile Crisis, the assassinations of John and Bobby Kennedy, Martin Luther King's luminous epiphany and tragic death, Lyndon Johnson's launch, both of the Great Society, and the Great Debacle of the Vietnam War, which would cripple it. The Beatles were there, and the Stones, and Dylan, and Baez, and the sit-ins at Berkeley and Columbia. All in one decade! What is now called Modern simply was not strident enough to compete.

The conceits of theorists of Charles Jencks' generation notwithstanding, the Modern did not suffer intellectual defeat; its ideas were not discredited, thus leading to a deserved overthrow. *Its ideas were embedded in its practices*, hence dependent on uninterrupted practical and experiential transmission. These were interrupted as a generation of youths attended to other matters.
In consequence, our academy endured its own minor Revolution in the late sixties and early seventies. The intellectual climate was analogous in some small way to that of the Terror. The Modern consensus had dissolved. Descriptive geometry — product of the Enlightenment — suffered much as had Monge, its founder, 175 years before. It was put to flight and vanished as a theoretical discipline. Some small amount of the content, perceived by the revolutionaries to be relevant, survived in inarticulate form as the practice of architectural graphics. Theory, like a spot light in a cavernous and darkened room, now played on other contents, most notably design and educational methods.

As is customary in Revolutions, the New Regime eventually wrote the stories of the nature and significance of the Old. In the intervening years I have heard and read many stories of the Modern in design. Each failed to encompass or characterize the life of the mind in a design school of that era. The best (indeed, the only adequate) account remains Benevolo's two volume history , published the year I started school.

Revisionism is always immature, with suspect motives of its own; in the zeal to avoid content, which implied judgment and hence, authority, the academy paid its theoretical attention to methods (particularly educational and political methods) by which one (anyone) might construct a valid future.

Unfortunately, few were wise enough to realize those methods had no consequence for built form. An entire generation was educated as designers using only a primitive, value-neutral taxonomy of form to guide decision.

Nevertheless, it was a good time to study design education. Almost accidentally I began to teach.

Another decade and I began to teach overseas. Instruction was in English, though for the students English was a second or third language. Rarefied discourse — the terms and phrasings I learned in graduate school and practiced in St. Louis on hyper-intellectual, urban graduate students — now failed to connect.

I rediscovered the experiential foundations of studio teaching, and began to speak more simply i discovered a truth that every poet, every mystic, and every humorist already knows. Bad poetry, weak faith, and most humor is grounded in confusion of the literal with the figurative.

The Zen koan warns, "There is a finger pointing at the moon. Do not mistake the finger, pointing, for the moon."
An indignant customer complains to his waiter: "What's that fly doing in my soup?" Dutifully the waiter inspects the bowl and then explains, "It looks like the backstroke to me, sir."
Theoretical discourse suffers just this jumbled fate as it crosses linguistic and cultural divides. Metaphor and parable, humorous or serious, survive the transit intact. I began to tell stories, not to entertain, but as a means to convey ideas, to convey the import of ideas.

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4

Everything I needed to know I learned in...

We all study math to get through school. Our diploma requires it, and some parts of our curriculum actually use it. I suspect we all studied it in much the same way. I taught math for several years, and devoted years to the study of geometry. From today's perspective in late career, the realizations that strike me most are *how little of what I studied proved useful, and how much my understanding of the life of the mind has been shaped by mathematical ideas*. Two species of ideas remain in my mind: one is a small set of basic principles and operations of constant utility; the second, a world of forms and transformations of negligible utility but great beauty. In Frank Oppenheimer's words, "Understanding is a lot like sex. It's got a practical purpose, but that's not why people do it normally."

Unlike mathematics, design is not a particularly intellectual or theoretical field. Like its sister discipline, however, the ideas that have the competence to engage practice are few and comparatively simple. The theories design employs are largely technical in nature. What is called criticism today is rarely specific, or directed to the goal of improving the way we do things, or improving the adequacy to their settings or purposes of the things we do. Post-occupancy evaluation is the closest the field has to reflective practice, but critics disdain this role. What is called criticism operates like a 'bait and switch'; self-referential discourse about an artificially delimited alter-sujet is substituted for the more difficult task of contending with the specificity of architectural content.

Can a theoretician not evince as much interest in metallurgy as in metaphysics? Display as much curiosity about the Corinthian helmet [Fig. 3] as about the symbology of the guttæ on the Parthenon? Be as much in love with the promise of the future as the presence of the past? [Fig. 4] Be more concerned with a democracy of the human spirit than the dogmatic intellection of an academic (and practically defunct) Marxism? Be as much bemused by clarity as by hermeneutics?

May we not devise a critical tradition which recognizes in the solipsistic tendencies inherent in (for instance) a Heidegger, not the promise of a greater, more authentic truth, but the threat of an autocratic vision; one too disdainful of the popular mind to be bothered with either explication or justification?

Architecture embraces the academic at its peril. Though situated in the university it is still a professional field, not an academic discipline. However, its setting promotes anxiety, externalized as a rhythmic identity crisis leading to (other) disciplinary envy. Twenty-five years ago architecture abandoned equilibrium and lurched toward the social sciences. Today it has an advanced case of Humanities-Envy, one symptom of which is to turn attention away from the open-ended, outer world of sense and event and toward progressively more self-contained and self-referential *verbal argumentation*.

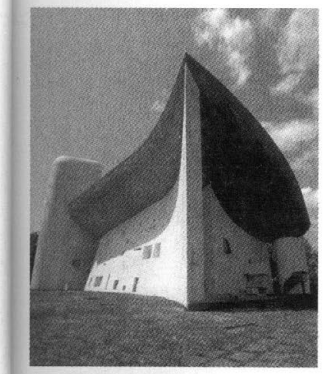
Those fundamental ideas that have the capacity to guide practice, to effect an interface with design, are simple, rather than convoluted, clear rather than conflicted, constructs rather than deconstructions. As such, perhaps they fly beneath the radar of theoreticians. But they fly, and enable flight.

Have sophisticated abstractions no role in design?

In fact, there is no intrinsic limit to the capacity of abstract terms or operations to embody an immediate qualitative sense or to be vehicles for signification. The telescope and the microscope extend our vision; they allow us to cross the boundaries placed on sight by the resolving power of the lens of the eye and the grain of the retina. The scanning electron microscope pushes beyond the boundaries imposed on resolution by the grain of the retina and the periodicity of the wavelengths of visible light. The use of infrared sensitive film allows us to image as if to vision structures in the world that we can never see, structures revealed only by electromagnetic frequencies to which our eyes are insensitive. The photographic plate enables the imaging of high frequency energies which pass straight through soft tissue like the eye.

Though vision is continually augmented by technical developments that allow one to receive reports from beyond the edge of human perception, these instruments render their exotic images to ordinary sense. Imagination construes their import. Nothing intrinsic precludes the possibility that speculative abstractions emanating from afar may someday inform practice. But an architect who hopes to borrow insight from another discipline — applicable at home right now — might more profitably look to Peter Senge's *The Fifth Discipline*, or John Van Maanen's case studies *Tales of the Field* than to the work of *Deleuze* or *Lacan*.

What is wanted is *specificity* of thought, which lies neither in the domain of the concrete nor the abstract. There are no particular things which are abstract, nor others which are concrete. The terms refer to how a given thing is being taken up in thought. They mark a direction in the trajectory of viable reflection or anticipation, either away from things as encountered, or toward them as such. Specificity inheres in those developmental acts which bind abstraction to concreteness in some particular fashion.



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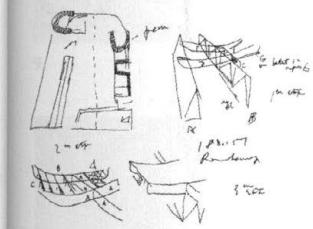

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"We at Braun believe that simple is better than complicated..."

So the elegant television ad began, and enumerated the firm's core values. Design principles are constituted by values, not discourse — a predilection to seek the simple in preference to the complicated, the coherent in preference to bare conjunction, a choice to seek substance in preference to semblance, a choice to heed the call to serve — *that they may have life, and have it more abundantly* — rather than to pose.

There is no doubt that, on the surface, the world of architecture today is more permissive than the one I was introduced to by my teachers. I envy no one that difference. No theory permitted Ronchamp before the fact. It was won, not granted, and we have a building for the ages in consequence. [Fig. 5] Qualitative, synthetic thought constructed elegant, practical solutions to problems posed by vision. [Figs. 6, 7] Fifty years ago Graves' Disney Hotel would have been equally unthinkable. Does permitting it imply a progress of sensibility?

One story in the margins of *Richard Wurman's Information Anxiety* caught my eye. It's a small spatial story that speaks of limit and principle. Ted Williams was the greatest hitter in the history of baseball. The last major league hitter with a season batting average over 400. Noted for excellent eyesight (20/10), and for never swinging at a pitch outside the strike zone. A reporter quizzed him once about these notables. Williams' terse, matter-of-fact answers are like ancient parables across today's elastic, conflicted landscape.

R: Is it true your vision is unusually good?
TW: Yes.
R: Is it true you only swing at pitches in the strike zone?
TW: Yes.
R: Wouldn't you get more hits if you swung at more pitches?
TW: Probably.
R: So why don't you swing at some of those just outside the strike zone?
TW: I wouldn't know where to draw the line.

I draw the line thus:
With whatever else it may sometimes be concerned, all design is always about the external world.

The ways in which the world shows itself to us (phenomena) are stable indices to deep structures (principles, laws) which underlie and give rise to them. There is no such thing as mere appearance.

At any given moment our sense of and conception of this world are only indifferently adequate as tools to manage the course of our future transactions. There are more things in heaven and earth...

The contents, attributes, and qualities of the world as found are continuous with those of any world transformed by our designs. To attend to given qualities is to develop a storehouse of imagery which pertains as fully to the possible as to the actual from which it is drawn.

Authentic perception, directed by active intelligence, is adequate to enlarge and indefinitely differentiate our storehouses of imagery. In C. S. Lewis' words, the universe rings true wherever we fairly test it.

To be concerned with the world as human habitat is to see the world as value-laden. This concern is not reciprocal. We may grasp the world by means of our ideas and practices, and hence, in this restricted sense, ideation may be called primary, constitutive. But not any idea or practice will do; the world displays a stubborn recalcitrance to be fruitfully encompassed by accounts of it that do not take it into account.

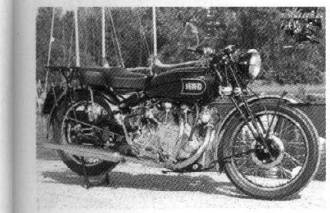
Design ideas display a reciprocal trajectory: increasingly general structures arise from and articulate experience, while increasingly specific structures reenter and regulate experience.
Conceptions are instruments of thought, not autonomous constructs. Design theory must provide advantage in design action to establish a credible interface with practice.

In the building sciences and in the geometry of description design comes as close as it can come to employing what should be called theory.

Mnemonics

A modest set of elementary themes form the lens through which I view the interface between theory and practice.

ONE: first principles & parsimony: in the Modern worldview design thinking always was seen as a search for first (i.e., fundamental) principles—*"to the roots of the things themselves"*, to paraphrase Husserl. A considered design response necessarily reformulates given, which is to say culturally received, forms.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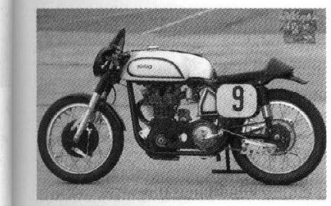

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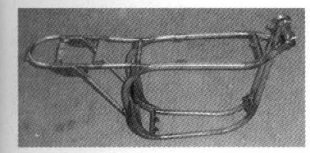
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PHILIP VINCENT designed the now legendary motorcycle that bore his name. [Fig. 8] His formulations of the root problems in motorcycle design were radically at odds with those of his contemporaries half a century ago. Vincent's business venture, vigorously innovative for several decades, failed in the middle fifties.
Conventional design formulations (the Norton Manx with its 'featherbed' frame was one) [Fig. 9] seemed temporarily validated by the Vincent's demise. Several decades later Norton, too, passed into history. One by one the components of the paradigm which Norton had embodied — vertical twin engine, separate cradle frame [Fig. 10], twin shock rear suspension — were replaced by Philip Vincent's anticipatory innovations, reappearing in the guise of universal, mainstream practice.

Vincent reasoned that high performance meant balanced performance over the life of the machine. The primary enemies to be overcome were excess weight, insufficient rigidity, and highly stressed drivetrain components. His contemporaries sought to resolve these problems singly; Vincent took a whole systems approach.

He configured the engine as a Vee, the plane of the engine coincident with the cycle's longitudinal plane. The front cylinder head lay conveniently near the steering head, the rear suggestively near the rear suspension. The structural exigencies with which an internal combustion engine must cope are inherently stringent. Vincent bridged between the cylinder heads (the open ends of the Vee) with a structural oil reservoir. Fully triangulated, the engine was now rigid enough to

serve as frame. He bolted the steering head to the front of the oil reservoir, the rear swing arm to the integral transmission case.

The conventional swing arm is a plane structure; the major forces act perpendicular to the plane. Flexure is unavoidable. Vincent trianglulated this element also, and attached one end of the coilspring shock at this new apex, the other to the rear of the oil reservoir. All major forces were thus resolved within a compact and rigid zone; the engine tied it all together. [Fig. 11]

There were other innovations, all characterized by Vincent's characteristic analytic clarity, the same synthetic approach to resolution. The ones just covered suffice to illustrate the core principles: drive every issue back to first principles; ask every element to play more than one role; integrate the component contributions in a nested, whole systems hierarchy.

Vincent's vision wrought synergy and balance. The resulting machine afforded superlative performance — acceleration, top speed, fuel economy, handling, braking, reliability. If you have the time and the inclination, search among current motorcycle specifications for a 1000cc displacement, high performance machine with a curb weight of 400 pounds. Good luck!

TWO: the morphological presupposition: *theologians once based arguments for the existence of a Creator by appealing to formed events in the given world as evidence from which one must infer purpose and design. If phenomena exhibit design, what they show forth is evidence for their Designer.*

Natural science and systems theory give a different account: what we read as form in nature is a transitory balance, one which comes about as small, undirected increments of change tune exigency to opportunity. Equilibration, they call the process.

The Argument from Design drew inference from living form. While the concept of equilibration derives from the life sciences, one can illustrate the principle just as clearly with physics. [Fig. 12] As physicist David Gross declares, "At the fundamental level nature, for whatever reason, prefers beauty."

ANTONIO GAUDI devised an equilibrating, natural computer to ensure his complex, visionary forms were in structural equilibrium.

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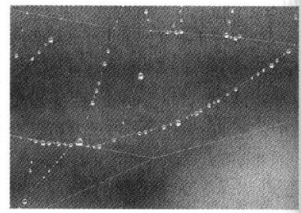

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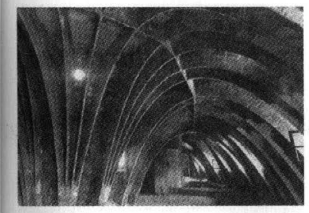

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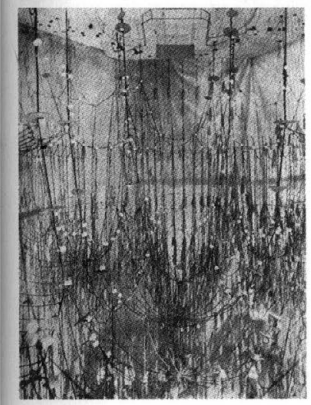

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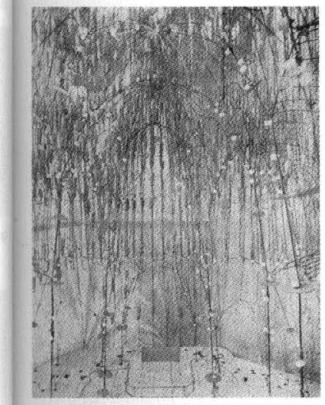

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Picture a finely wrought and supple chain hanging in a generous and graceful loop from two attachment points overhead. The curve it assumes is a catenary, from the Latin word for chain. It is the formal embodiment of tensile equilibrium, its purity constrained only by the uniformity and suppleness of the chain within which the balance is established.

Next, picture a third attachment point forming a triangle with the other two. Hang a second length of chain from this one, then connect the free end to any point along the catenary. The system is momentarily thrown off balance; it swings back and forth. Then the movements dampen and the chains become still. A new tensile equilibrium has been established, one which takes into adequate account the change in conditions resulting from the weight and position of the second chain.

Gaudi used the procedure in simple multiples to derive catenary arches. [Fig. 13] Suspended as a chain, the catenary represents pure tensile equilibrium; inverted, the same curve describes a similarly pure resolution in compression.

There is no intrinsic limit to the number and variety of tensile forces that Gaudi's device could resolve, simultaneously and dynamically — real time, in current cant. More complex structures required some calculation, as added weights differentiated the uniformity of the chains to account for what Gaudi knew to be varying or concentrated loads below (i.e., above). [Fig. 14]

Inverted, the photographic image anticipates a computer wireframe. [Fig. 15] Gaudi draped his chains in cloth to better visualize the resultant architectural form. [Fig. 16]

Juan Bassegoda Nonell, a noted Gaudi scholar, exposes Gaudi's predilections and methodology clearly:

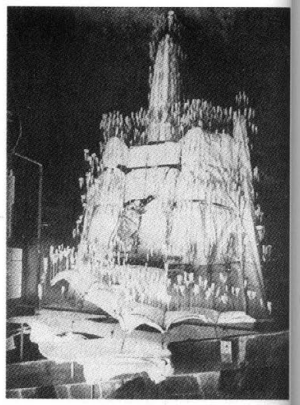
If nature works by always looking for final solutions, since it is subject to the inexorable law of gravity, there is great wisdom in studying natural structures, which have been accredited by millions of years of perfect functioning. Knowing the essence of these structures, Gaudi sought to bring them to the arena of building.
He observed that in nature many structures are composed of fibrous materials, such as wood, bone, muscle, or tendon. From the viewpoint of geometry, fibers are straight lines and curved surfaces in space made up of straight lines that define a straight-line geometry, which is based on just four distinct surfaces: the helicoid, the hyperboloid, the

conoid, and the hyperbolic paraboloid. Gaudi saw these surfaces in nature and brought them to architecture.
The helicoid is the form of a tree trunk, and Gaudi used this form in the columns of the Teresian School. The hyperboloid is the form of the femur, a form he used in the columns of the Sagrada Familia. The conoid is a form frequently found in the leaves of trees, and this form he used in the roofs of the Provisional Schools of the Sagrada Familia. The hyperbolic paraboloid is formed by the tendons between the fingers of the hand, and he built with this form the porch domes of the church crypt in the Guell Estate.

Subsequent designers in a long, unbroken lineage follow Gaudi: Freyssinet, Maillart, Nervi, Candela, Isler... Each has seen design from a similar perspective. Form, revealed through nature, experiment, and practice, played an equilibrating function in their art. In all design most of the factors that need balancing and conjoining are external to the volition of the designer who cannot choose them, or choose whether to deal with them. The designer who embraces these factors on objective terms finds beauty in the necessity of deep structures.
The *works* of humankind reenter and enlarge the given external world. Whatever we do embodies within it a constellation of characteristics or attributes, which flow from our actions as their consequences. Their variable fortunes with the vicissitudes of natural forces and processes present instructive criticism for those attentive and patient enough to read them.

Robert Maillart discovered cracks in the reinforced concrete webbing of an early bridge. Maillart realized the cracked concrete was not doing anything useful; if its contribution had been essential the structure would have failed. In a subsequent design, rather than strengthening these areas, he carved away large portions of them [Fig. 17], and so began the series of elegant designs for which Maillart is famed.
The structural approaches of Nervi and Candela proved as applicable to factories and warehouses [Fig. 18] as to churches [Fig. 19]. The economies they achieved with thin shells were authentic.

The beautiful economies attained by these acknowledged masters of structural form stand in stark contrast to the celebrated Sydney Opera House. The so-called freely shaped shells became a prison for all involved. Eventually the architect was fired, the engineers gave up on the shell analysis after countless hours and resolved the structure as a series



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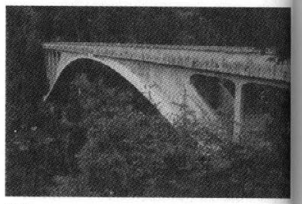

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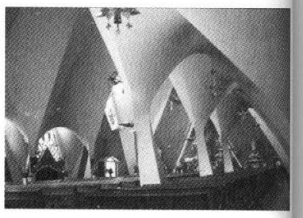

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of arches, while the owners paid over twenty times the initial cost estimate for a scaled-down version of the initial plan, a mere semblance of Utzøn's original vision.

David Billington's *The Tower and the Bridge* is an extended essay on the ideas and practices of structural art. In a chapter on the work of Heinz Isler the author draws extensively on Johan Huizinga (from Homo Ludens). Among the quoted passages is this: "...the profound affinity between play and order is perhaps the reason why play seems to be to such a large extent in the field of aesthetics. Play has a tendency to be beautiful."

Billington concludes:

As the Swiss air freezes, Isler can be found night after night spraying water on tent-like sheets of gardener's netting or inflated balloons or on shrubs or trees to create a world of ice forms—pure play out of nature's cool discipline. These temporary forms flow out of Isler's exuberance and curiosity... [Fig. 20]

What Candela wrote of Maillart could be taken as a mantra for the ensemble:

He achieved a beauty without need or purpose; just for the pure joy of it. The kind of joy that you can feel also in the works of Haydn or Vivaldi. They were simply enjoying what they were doing...

THREE: the geometry of buildable form: *though form brings an ideational component to design, it is not some thing added to other things, another entity among the elements making up design. Think of it as a function rather than a thing, a process or activity whose role it is to unify, proportion, balance, adjudicate, and render coherent, intelligible, and fulfilling the often discontinuous, competing, conflicting elements in a design situation.*

For an architect form must be built. Looming large, therefore, among the competing, conflicting elements to be unified and fulfilled are structural and constructional ones. From the Pantheon and Hagia Sophia to the designs of Gaudi, Maillart, Nervi, and Candela, the time-honored means to address both concerns is through the rationalization of form. Two projects, one tiny, the other immense, can serve to illustrate how an interest in buildable form can lead two designers to make similar formal choices.

The development of the modern cruising multihull sailboat owes more to Jim Brown than to any other living boat

designer. Known to many as Trimaran Jim, Brown — like Maillart, Nervi, and Candela — epitomizes the Reflective Practitioner; he builds, and sails, and lives with his designs. Brown repeatedly reformulates both ideas and practices, based on long and intimate observation. He formalized and patented the essential core; ConstantCamber he calls it.

To realize the performance potential of the type, a sailing multihull must be both light and rigid. Billington's observations about the imperatives of larger forms of structural art apply as well to boats:

Geometry makes forms lighter and, hence, loads smaller, whereas mass makes forms heavy and increases loads... The thin shell solution is a structure made as thin as is practical, which is at the same time mainly in compression. The designer best satisfies this goal by making a form that is doubly curved... and that has a minimum of sharp changes in thickness, in curvature, or in boundaries.

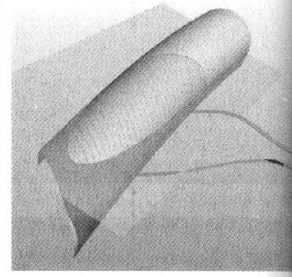
A thin shell — as thin as is practical — with double curvature is ideal.

Cold-molding is the preferred constructional method. Thin veneers of wood, saturated with epoxy resin, are laid up in layers over a mold. Atmospheric pressure (vacuum bagging) does the clamping. Fibers other than cellulose can be used but all are heavier (most wood floats) and more costly.

Epoxy cures (hardens) through an exothermic, catalytic reaction. Working time is short. The adhesive is strong and tough; builders dread mistakes in layup. If the thin-shell hull form meets only structural or hydrodynamic criteria the likelihood is great that each cross-section of the form is unique. Each veneer strip must be similarly unique, meaning uniquely spiled (its shape derived in situ), and cut, and placed. Uniqueness is time intensive, at odds with the constructional imperatives of cold-molding with epoxy.

Brown's insight was to realize that *all* criteria for a thin-shell hull — structural, hydrodynamic, and constructional — could be satisfied by sections cut from a pair of mirrored, appropriately profiled, toroidal surfaces, one for each side of the hull. [Fig. 21] As an added benefit the mold becomes easy to build. However complex the profile, all mold stations are identical, and the entire mold surface can be strip planked with identical elements following circumferential lines. [Fig. 22]

The choice to work within the (quite elastic) limits of a toroid imposes a formal discipline, a form language with predispositions for coherence across a spectrum of vital concerns,



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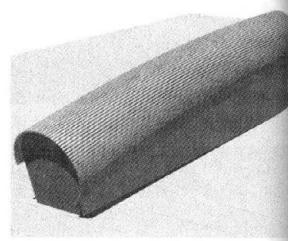

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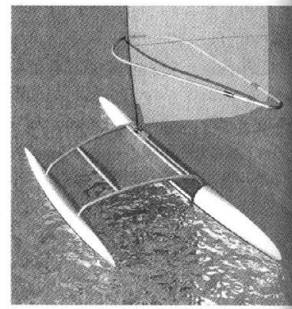

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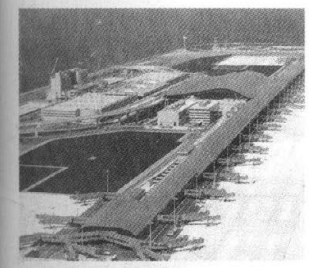

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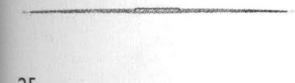

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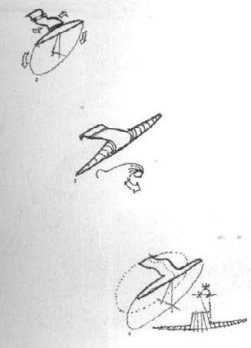

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yet within which beauty remains a possibility. [Fig. 23]

KANSAI IS Japan's second most populous region, but only one airport served its 20 million inhabitants. Last updated in 1970 and hemmed in by the city of Osaka, Itami International could neither expand nor extend its operating hours.

Officials boldly decided to construct a new airport on an artificial island in Osaka Bay, with takeoff and landing paths entirely over the sea. The enormous costs of construction would be offset by the economies of a 24 hour airport.

Situated 5 kilometers offshore in 20 meters of water, the island took five years to complete. It connects to the mainland by road, rail, and hydrofoil.

The terminal authorities adopted a novel scheme proposed by experts in Paris. Renzo Piano's Building Workshop, teamed with Ove Arup & Partners, won the contract for the terminal building. The terms of the contract obliged Piano's consortium to coordinate planning with the French team and to implement their innovative schematic, which called for the domestic and international terminals to be stacked, rather than bi-polar.

The airport project was to become a model of design as complex synthesis. The Building Workshop's signature whole systems, collaborative approach to design is nowhere more richly realized than at Kansai.

Only a few aspects of this remarkable project fit within the scope of the present paper. Our discussion will be limited to those prime respects in which the vast and complex Kansai airport resembles Jim Brown's work with multihulls: for a complex of similar motives, the terminal project employs a geometry of toroidal surfaces.

The region is subject to vast cyclonic storms called typhoons, the Pacific equivalent to an Atlantic hurricane. Typhoon stormheads reach altitudes of 24,000 meters, with winds in excess of 220 kph. Meterologists estimate that the total energy in a major cyclonic storm system is sufficient, if harnessed, to meet North America's energy needs for a week.

Not hydrodynamic, but anticipated aerodynamic forces urged the adoption of ...a form that is doubly curved... [with] a minimum of sharp changes in thickness, in curvature, or in boundaries.... (Billington)

Designed as a single runway airport , the Kansai terminal building is necessarily long and narrow, stretching two thirds the 4.4 km length of the island. [Fig. 24] The scale of the underlying toroidal geometry is similarly immense, with a radius of some 17 km, a dimension established by the required overall concourse length, together with the height differential between the end of the concourse and the central hall. The resulting longitudinal curvature, though subtle, is evident in the runway (sea) elevation. [Fig. 25]

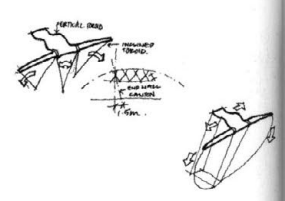
While Jim Brown's formulation slices a section from the toroidal surface with what will become the centerline plane of the hull, the Building Workshop uses the entire designed profile from end to end.

Various strategies were considered to integrate the entire airport roof within a single system (... a minimum of sharp changes in thickness, in curvature, or in boundaries....). Early schemes sought to incorporate the deep, central arrival and departure hall within the toroidal strategy. This was finally abandoned, in part because the plan of the great hall would necessarily taper (by 1.5 m), in part because the enormous trusses that spanned the space would have to tilt. [Fig. 26] Buildability demanded uniform truss profiles; to be uniform, the cross sections of a torus must radiate from the axis of the form, hence the sections (the trusses) would have to tilt. The much smaller, shorter trusses used to span the (toroidal) concourse wings are also uniform in profile and do, in fact, tilt.

The solution that was finally adopted was a single, faired surface with a hybrid geometry. The central hall would have a cylindrical geometry; the long concourse wings would be toroidal surfaces. [Fig. 27] The forms merge seamlessly in transverse and longitudinal sections, using a technique any road (or typeface) designer would recognize. [Fig. 28]

The great difference in scale between the arrival and departure hall and the concourse is revealed in both (partial) plan [Fig. 29] and transverse section [Fig. 30]. The concourse zone has been tinted in both drawings for clarity.

Like that developed for the central hall, the profile used for the concourse wings is a faired set of curves with a compound geometry. [Fig. 31] The profile splits as roof becomes façade; one part peels away to form a protective canopy, the other wraps past the vertical as glazing. [Fig. 32]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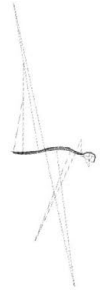
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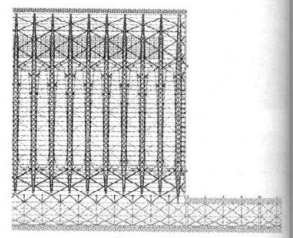
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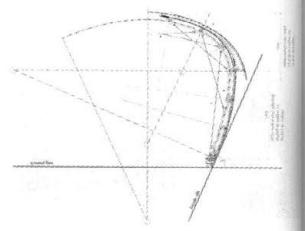
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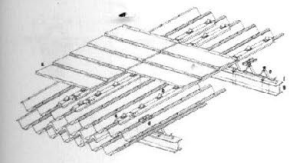
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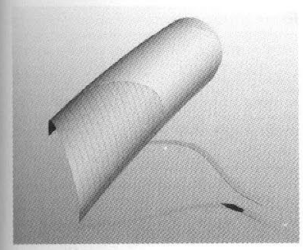
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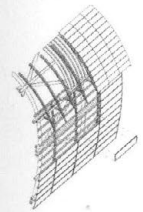
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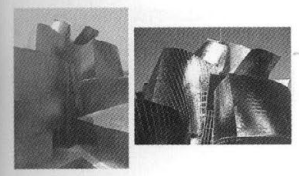
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Technically, neither Brown's hull forms nor the Kansai structure are shells; rather, both are built-up skins. While Kansai is skin-on-frame, Brown's cold-molded hulls are monococques. The skin elements in Kansai have mechanical fastenings; Brown's method uses chemical bonding. Both skins are many-layered. Brown uses diagonal strips, all identical. Alternate layers mirror directions; Brown turns the strips over. Kansai's many-layered skin is more complex by far [Fig. 33]; each layer plays a different role.

Jim Brown and the Building Workshop share a similar concern for buildable form. At Kansai, as in ConstantCamber, this concern is manifest in a strategy of uniform elements from which to make the skin. In ConstantCamber the veneer elements run across the mold from edge to edge. [Fig. 34] While all strips are uniform in shape, within a strip the width varies with the distance from the toroid axis.

Strictly speaking the same should be true of Kansai, but the rise and fall of the profile is negligible compared to the much larger radius of the torus. The panels that comprise the outer skin are all the same, all planar, all rectangular. The theoretical disparity in edge lengths is so minute in absolute dimension ($\leq$ 5mm) that the difference is accommodated by the reveals between the panels. [Fig. 35]

This strategy stands in marked contrast to the new Guggenheim Museum in Bilbao, where concern for uniformity or planarity in the tiling elements was subjugated to Gehry's plastic vision. [Fig. 36] The contrast in design values can be drawn even more sharply; thinking ConstantCamber would resolve constructional problems, Gehry consulted Brown on a version of the 'crumpled handkerchief' roof, part of the (now infamous) house project for Peter Lewis . When the two designers each discovered the other's formal predilections the consultancy ended.

Toroids play another, non-structural role inside the arrival and departure hall. A whole systems synthesis resolved what are often competing interests: that of the designer for a clean, uncluttered interior space; that of the mechanical engineer for optimum (plentiful, well-mixed, noiseless, draft-free) distribution of conditioned air. The outlets, high along the edge of the main span, blow a ceiling-hugging stream of air along the grain between the trusses. [Fig. 37] A suspended toroidal profile, formed in fabric, is shaped to ensure laminar

air flow. Its curve falls and tightens in tune with the diminishing velocity of the cool (and falling) air. [Fig. 38]

All design is an interplay between intentions, means, and attributes. The designer's every act embodies within it a constellation of attributes, which flow from it as its consequences. The designer tunes each instrument until its consequences are consistent with her purposes. In fact, a designer employs many instruments in any given project. In complex ones like Kansai plural attributes of plural instruments overlap and interact.

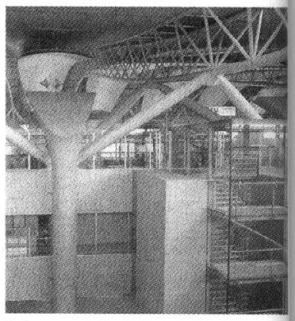
What is meant by a whole systems approach is that the designer chooses a nested hierarchy of solutions (instruments) inherently congruent with one another and with need at every level. Usually, but not necessarily, this is achieved through systems of components, each chosen for its own proven merit as a device, and for its proven ability to integrate with other systems in the hierarchy.

Rarely do such fully integrated, whole systems arise within a single project. Rather, they come about incrementally over an extended period of time as the designer, in pursuit of consistent objectives and ruled by persistent values, refines a favored set of strategies and components. It honors the quality of underlying thought to call the resulting forms equilibrations. The coherent hierarchy of mutually supportive, self consistent systems of devices and strategies one finds in Kansai is the mature product of what Peter Senge terms a Learning Organization.

FOUR: buildable form and social conscience: because ConstantCamber caught the attention of influential people, and because Jim Brown is caring as well as competent, the World Bank called on him to visit various parts of the developing world and conduct small experiments in the transfer of appropriate technology and expertise.

IN AFRICA, the livelihood of Burundi fishermen was jeopardized by the worst aspects of so-called modernization. Traditional Burundi watercraft were long, slender dugout canoes. Timber harvest for export had depleted the stock of trees large enough for new canoes. The older canoes lay rotting; imported outboard motors favored other hull forms, also imported. Between initial cost, maintenance, and fuel, the outboard's cluster of imported technologies combined to make fishing unprofitable.

Brown designed a thin-shell, ConstantCamber canoe, taught the Burundi how to build it using local tools and timber



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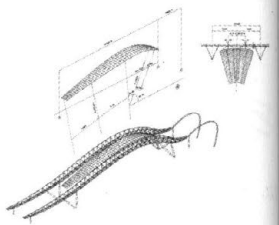

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(cold-molding with epoxy-saturated wood veneer is tolerant about timber type and quality). The World Bank supplied epoxy. The Burundi's new canoes are light and easily driven; paddles provide ample power. With the outboards retired from service, income went up, costs went down, and Jim went home.

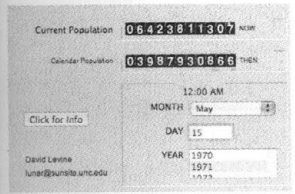
Epilogue: Learning from Kikwit

The parable of the Good Samaritan launches from what seems a simple question: "And who is my neighbor?" This one's similar: "And who will be your clients?"

We talk about the global village, the global economy, a global architectural practice. We talk glibly, without real thought. We speak of cities and civilization, urbanity, and arcadia, and culture. Many images we attend to are of long ago and far away. I love Greece, and Homer, delight in the tales of Leonidas and Phidippides. Delphi, and Epidauros, and Olympia are more vivid in my mind than Solidere's new Downtown. Mirrors reflect, and Distant ones give perspective. But ours are often enchanted, and distort. Athens in the Golden Age was home to fewer than 100,000. Art and philosophy flourished there, along with slavery, invasion, intrigue, colonies and empire, and incessant, exhausting warfare.

Florence entered the 14th century with a similar population, was reduced in mid-century by famine and plague to half, or less. This horror and war-beset polis was home to Michelangelo, and Leonardo, and Savanarola. Eliot's genteel salon image of people passing "To and fro, speaking of Michelangelo..." belongs to a remote, moonglow definition of culture; reflected light, not light produced. When you think of Renaissance Florence, Florence of the Medici, think of recent Sarajevo, not Paris through the eyes of Stein, or Nin, or Hemingway, or Miller.
Rederive the entire life of them, and few cities of the past appeal more than those we know, and love, and loathe, and fear, and struggle with today. But there are other cities, and the lessons of the past, or of Las Vegas, have little to do with them. They are cities waiting to occur, unintended cities, many, many cities.

A few clicks of the mouse a few days ago and a just-discovered web-site displayed a huge and undigestible number on my computer monitor: 6,423,811,307 it read when I first logged on. [Fig. 39] The number was a guess; another site claimed 50 million more. Thirty seconds later the digits



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rolled, like some terrible odometer, and the number grew. Half-minute by half-minute, I watched updated estimates of global human population.

Every month we grow by six million souls. Almost twice the population of Lebanon or the UAE, new, each month.

The birth rate, minus the death rate, equals population growth. Current global estimates forecast 50 new Beiruts [Fig. 40] each year — or 75 Dubais. Dubai, the Gulf miracle, which boasts of a population growth of 25% over the past five years. There won't be a Burj Al-Arab, a Phoenicia Hotel, a Hamra Street, or an AUS or LAU in any of them. Kikwit, Zaire, will be closer to the norm than either Dubai or Beirut.

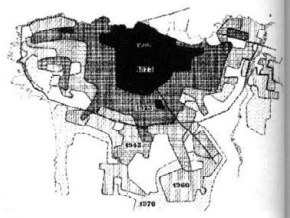
Do you remember Kikwit? You should — no — you must remember Kikwit. A place name I never heard before was burned into consciousness and conscience when hemorrhagic fever (ebola) broke out there in 1995. "Kikwit General Hospital," the news anchor announced. Mental images of my local modern hospital were shattered as newsreel footage presented tin roofs, concrete blocks, sheds scattered amongst the grass and mud and forest, knit together by dirt roads and paths. Kikwit was a village, not a city.

What caught my imagination was its size; fully half the size of Dubai. Seventy-five or more new Dubais each year? No; one hundred fifty new Kikwits! Are our theories of Good City Form adequate to address these needs, these cities, these urbanites? Lady Barbara Ward called such a city the unintended metropolis. Unanticipated urgency has eclipsed intention. Narcissistic æstheticism characterized the design arts at the close of the last century. Like a virus, it erupts periodically, when the body politic is in poor moral health. "When art is in the beauty parlor of civilization, neither art nor civilization is secure," wrote Dewey. It misses the point to claim there is a looming global need. We are engulfed in need right now, civilization is far from secure, the arts have deserted their post.

Humankind did reach a new century, technically, by clock and calendar several years ago. As parable, the marking of a thousand years signals transformation. Our neighbors' hopes and sensibilities are circumscribed by plague, and famine, by life in concentration camps, vile slums, on the fringes of encroaching deserts. Our neighbors are born and perish in Belfast, and Baghdad, Kinshasa, Sarajevo, Pyongyang, Calcutta, Washington, Groznyy, Madrid, New York. Can we, fashionable, fastidious, ironically detached, posing in post-history ignore their need? Are our cultivated sensibilities adequate to usher in the Millennium?

Kikwit, and the thousands of nameless, unknown Kikwits to come will be home to your neighbors, my children's neighbors.

Who will be their architects? Their theorists? Who among you has both will and competence?



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