NOTES ON AN INCOMPLETE ARCHITECTURE

ON THE BEWITCHMENT OF INTELLIGENCE AND THE NATURE OF HABITAT

MICHAEL MEHAFFY

WITH CONTRIBUTIONS FROM

BRIAN HANSON, PETER ELMLUND,
AND NIKOS A. SALINGAROS

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On the Bewitchment of Intelligence
and the Nature of Habitat

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Introduction: The Incomplete Gift

> *The final conclusion from (these) discussions… is the importance of a right adjustment of the process of abstraction… The higher animals are distinguished from mere life, by their abstractions, and by their use of them. Mankind is distinguished from animal life by its emphasis on abstractions. The degeneracy of mankind is distinguished from its uprise by the dominance of chill abstractions…"*
>
> *— A.N. Whitehead, 1937*

> *"When we ourselves become abstractions, we are lost!"*
>
> *— Frank Lloyd Wright, 1930*

There is a curious paradox at the heart of human intelligence. We are planetary masters at using abstractions, including languages, and (as this book will discuss) plans and designs. But there is a fundamental property at the heart of all abstractions, yet one that is largely hidden from our consciousness: they are profoundly "incomplete." That is, by their very nature, they must always leave something out of the picture they present to our consciousness. As the philosopher Alfred North Whitehead put it, "an abstraction is nothing other than an omission of part of the truth."

Our brains must ignore this incompleteness as we go about applying these abstractions, so that we may focus our attention on their fullest possible use. Our fluid and unself-conscious use of language and abstractions would become severely limited if we were constantly catching ourselves and saying, "of course, this is just an abstraction, not the reality." Instead, our brains naturally treat our abstract mental picture of the world *as* the world.

For the most part, this is a useful delusion. Indeed, it has given us breathtaking power over the natural world, and unprecedented abilities to plan, organize, exploit, heal, fly, dine, and create endless other marvels.

But as is the case with other human gifts, it comes with a dark side. There is a lurking danger within our abstract systems, for all their breathtaking power — or more accurately *because* of that power: the capacity to lose sight of sometimes crucial differences between our abstractions and the concrete and qualitative realities they mirror, and to commit what Whitehead referred to as "the fallacy of misplaced concreteness." We can do this in myriad ways – with myriad consequences.

It is a thesis of this book that just such "misplaced concreteness" — fragmented, confused abstract representations of the reality of our own actions and their impacts — is today having major consequences for the structures of our settlements, our technologies, and our cultures, as part of a rapid but relatively primitive (and temporarily so, one hopes) historic period of industrialization. Indeed, these impacts have turned out to be enormously destructive over time,

to the point that our condition is now unsustainable, and the evidence is mounting that catastrophe lies ahead. What is at stake may be nothing other than the success of the human species' evolutionary experiment with symbolic intelligence. No pressure.

It seems increasingly urgent that we confront the nature of this misunderstanding, and learn to reconcile the differences between the structures of nature, and the structures of human design — human "architectures" — up to now. That is the very broad subject of this book.

To be clear, as Whitehead noted, this breathtaking power of abstraction is, without doubt, humanity's defining talent. It gives us an unprecedented ability to conceptually model, "understand" (after a fashion), and manipulate the structures of nature, including the structures of our built environments. These structures can now propel us through the skies, across the land at high speeds, into the human body to perform surgical miracles, onto the landscape to plant and reap abundant harvests, and into enormous and luxurious cities and buildings.

At the heart of these innovations are breathtaking advances in the sciences that give us fundamental knowledge about the structures of nature, at cosmic, biological, molecular, atomic, and subatomic scales. This is an exhilarating adventure, and we are hugely privileged to live at this moment.

Recent advances, especially those of the last half-century or so, are all the more astonishing. We have come to understand fundamental properties of nature that had hitherto been hidden from our view: the dynamics of networks, the processes of evolution, the capacities for self-organization, the geometries of fractals and other structures embodying symmetry, and related phenomena. These and other advances demonstrate how our abstractions are capable of working so beautifully, if incompletely, as lenses on the wondrous reality around us.

Mathematicians have also made breathtaking advances into understanding the logical structure of incompleteness itself, as we will explore; and they have found proofs documenting the inability of *any* formal system to *completely* represent any other system, or (perhaps surprisingly, but tellingly) even itself. This form of "incompleteness" is common to all mathematical systems, all languages, and ultimately, all of knowledge. In a real sense, it is the precise mathematical description of Whitehead's "misplaced concreteness."

This revelation amounts to a remarkable trick: we are turning an abstract language on itself, so as to expose its own shortcomings! Thereby, we can compensate for those shortcomings, at least partially — although the danger of "misplaced concreteness" is always there, and we must work to resist it. This

was the point of the philosopher Ludwig Wittgenstein's clever double entendre, that "philosophy is a battle against the bewitchment of intelligence by means of language." It is language, and abstraction, that does the bewitching… but the same language and abstraction that we must harness in our philosophical battle against the bewitchment!

In this battle against bewitchment, or "misplaced concreteness," it is settlements that this book will examine in particular — the "architecture" of the title — but of course, there is also an "architecture" of our technological systems, our cultures, and even our languages and our thought. In fact, it is a marvelous capacity of language that it creates an "architecture of possibility" as a very real set of new structures in the world, leading the way to the creation of vast numbers of other created structures. The great adventure deepens.

There is a second, more direct reason for starting with our built environments: the ways we go about settling the world and structuring its surface are deeply interconnected with the ways we move, interact, consume resources, and damage, or regenerate, the larger natural habitat on which we depend. A "sustainable" world must have durable and thriving settlements, and societies that act and organize effectively within them.

But in spite of our breathtaking advances, we are far from "durable and thriving settlements and societies" — far from anything like true "sustainability." This is the great danger and challenge of this unfinished period we call modernity, or what some have defined as the modernist (and now postmodernist) epoch, in architecture and in other arenas of contemporary life. Therein lies another kind of incompleteness.

That is the other, more specific sense of the word "incompleteness" then, as it applies to the historical predicament in which we find ourselves today: an "incomplete architecture" that, for a number of related reasons, urgently requires reform. Certainly, the field of architecture has its own egregious problems when it comes to the seductive misplacement of abstractions, as Wright suggested. This book will consider some of them in detail.

In doing so, we will find these problems inextricably connected to other dysfunctions within our systems of technology, economics, politics, and culture, which we will also examine in some detail. Ultimately, these are all problems originating in our use of language — an essential dimension of all technology and all design — and in a particular form of bewitchment of our intelligence, as described by Wittgenstein's clever double entendre.

We are, in a sense, the victims of our own dramatic successes in using language and abstraction – a little like the Sorcerer's Apprentice, having unleashed a power we can't understand or control. The answer is certainly not to renounce

these tools, and to become literally idiotic – a path that, in the face of existential threats, seems suicidal. Nor can we stand pat with our current ways of doing things, which, it seems clear, are no less self-destructive. Human history is full of existential threats to which we have learned to adapt, and this historical moment is likely no different. It seems we have arrived at a point where we have no choice but to learn to use these same human gifts in smarter — and *wiser* — ways.

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It is a truism, but nonetheless true, that we are now at a watershed moment in human history. We face the enormous challenge of sustaining — let alone expanding — remarkable hard-won advancements in human development and well-being over the last few decades and centuries. The inequitable distribution of these advancements is also the cause of untenable forms of geopolitical instability and aggression, further carrying the fearsome new potential, in an era of breathtaking developments in nuclear and biological sciences, of mass destruction. Then too, there is the worrying degradation of cultural processes at the hands of technological systems, most recently illustrated by social media and the Internet (but with deeper and more insidious roots, as we will also explore). The dysfunctions they have produced call into question whether humans can thrive in the future, or even whether we can marshal the human capacity to respond with sufficient intelligence to a growing number and magnitude of potential catastrophes.

In both senses of the word "incomplete" — the broader philosophical one and the more specific historical one — our knowledge of how to respond to our current challenges is indeed incomplete, inherently so, but also just now, dangerously so. In the face of these limitations of incompleteness, we must better understand our predicament, how to compensate for our inadequacies, and how to chart an adaptive path forward.

It is worth bearing in mind that the existential challenges we face today have arisen almost entirely as byproducts of the pursuit of our own economic and cultural well-being — our astounding technologies, our breathtaking economic expansions, our historic advances in sanitation, medicine, agriculture, transportation, communications, and innumerable other fields. The pursuit of well-being that motivated these developments can hardly be suspended. On the contrary, we need to promote well-being for *more* of our species, more equitably *and* more sustainably. And that is our watershed paradox: how can we move to such a world, from where we are now? And how can we do it at a time when our institutions seem so dysfunctional, and so incapable of responding effectively? This is no less a great challenge of our time: the worrisome degradation not only of our natural world, but of our human systems of culture and technology — and ultimately, of effective action. It is time for a

reassessment from a broader perspective, so as to form the basis of a reinvigorated and more effective approach to our challenges.

This is not the first time that humanity has faced existential threats, of course. Indeed, the genetic evidence suggests that Homo Sapiens came near to extinction more than once in our history — and ironically just now, more than once because of climate change events. It is encouraging, at least, to know that we have been through very tough times and survived — in part because we have the remarkable capacity to develop new strategies, new technologies, and in particular, new ways of using abstractions. We escaped extinction more than once in the past by adapting, innovating, and developing new tools and new capacities: fish hooks, baskets, new kinds of settlements, and as it appears, new kinds of languages.

Our current predicament is unique in that it is we ourselves (and our technologies, and our abstractions) that have brought it about. The question arises whether we can get ahead of this dilemma, this "arms race of abstraction." I think so, because I think that is in the very nature of things, the nature of evolution. We are users of abstractions which get us into trouble, which we use again to get us out of trouble, which begets another kind of trouble… and so on.

Perhaps in this historical moment, in spite of its many evident differences from past crises, our need to adapt, to learn, to develop a smarter use of technologies and abstractions, is not fundamentally different. The principal difference may be that it is our misuse of abstractions themselves, and the crude and damaging forms of technology that have arisen, that most need adaptation. I think the design professions do offer an instructive case in point of the predicament, and with needed reforms, they may yet offer a hopeful path forward.

Yet early in the third decade of the twenty-first century, these professions appear increasingly confused, fragmented, and paralyzed by a postmodern and rather idiotic (again in the literal sense of the word) form of impotence. The best they seem able to offer is ever more fantastic pyrotechnics, art-for-art's-sake, "architainment" and "starchitecture," while the machinery of settlement grinds on ever more powerfully, with ever more disturbing results. Piling onto this unfolding tragedy are the patently feeble efforts at greenwashing everywhere — as if to say that sticking fancy propellers onto the same old business-as-usual buildings (or indeed, imagining ever more daring fantasies and avant-garde forms of art) will get us out of our fix, or even begin the serious work required.

In all the current work, the habits of thought, the methodologies, the technologies, the theories of nature and human nature, are all still mired in a Western, now global, orthodoxy of modernity and modernism that is now nearing a century old. We are like the alcoholic who must first admit there is a

problem, and recognize that the time has come for a reckoning. This is especially (but not only) true in the environmental design professions.

Indeed, there already was a reckoning beginning in the mid-century, when critics identified the need for a "post-modernism" that sought to reform the previous errors. Chief among these errors was the idea that we could ever "start from zero," that we could reinvent humanity, without destroying vital tissues of personal, cultural and biological life. But destroy them we did, to the point of catastrophe.

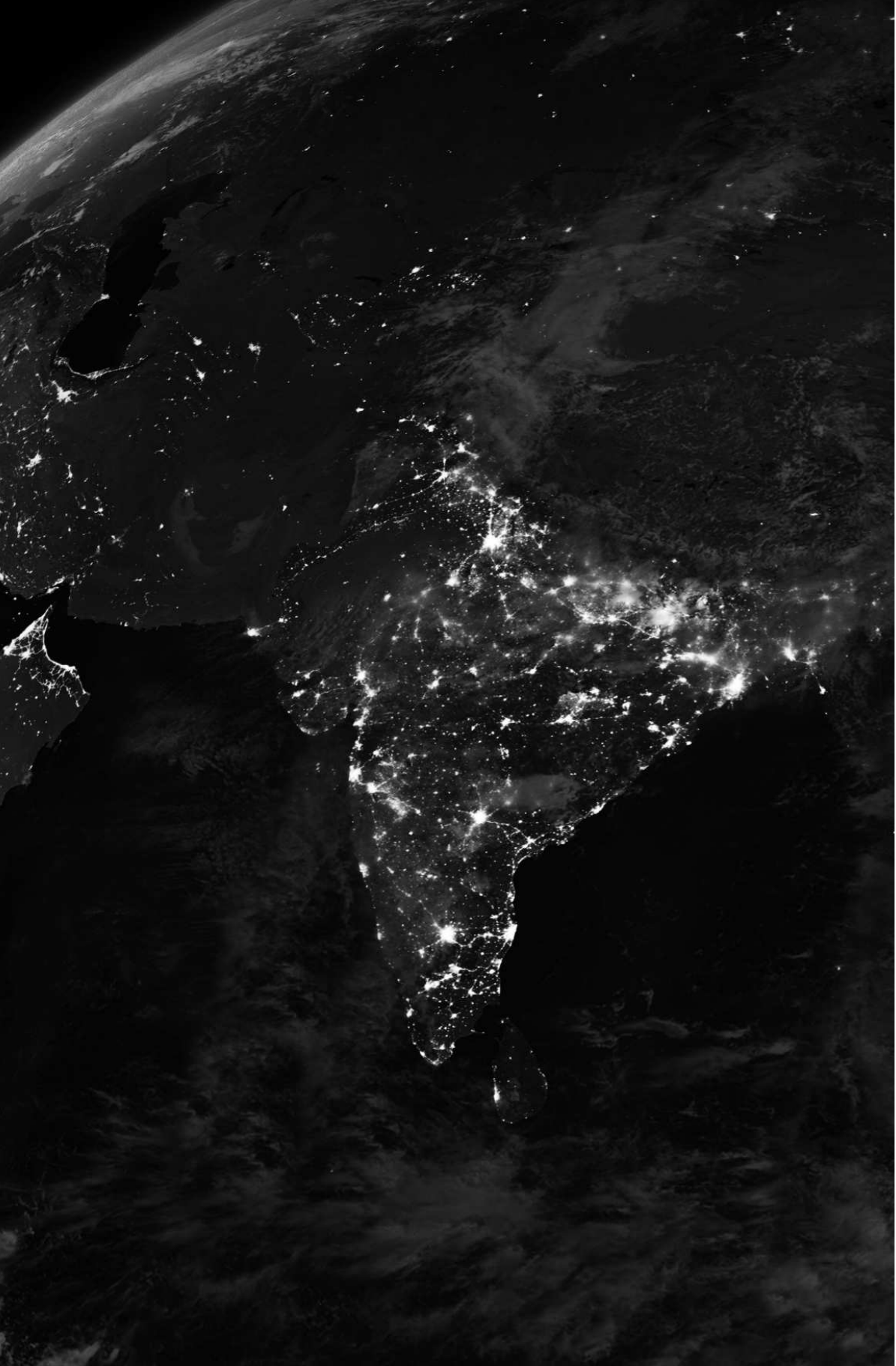
Meanwhile, the work of twentieth-century mathematics, biology, and related fields, have produced startling new (and remarkably precise) insights into the structures of complex processes, including human ones — and including the processes of applying abstractions, their dynamics, their weaknesses, their potential failures, and their correctives. Many of these insights recapitulate ancient and long-discounted forms of knowledge. These insights, new and old, are not only European and Western ones, though it happens that many were discovered there. Many others were discovered elsewhere over the centuries and millennia, and we must certainly give them all their due, for the history of humanity and its great advances is far larger than the story of Europe.

These findings, new and old, Western and not, describe remarkably universal patterns in the nature of things, transcending our own varied and incomplete forms of knowing. And they transcend, and leads us out of, our postmodern confusions too.

They also show us, as all great spiritual and philosophical thought does, the grandeur of the structure of reality, and its power to heal us as well as to destroy us, to inspire us as well as to paralyze us, and to show us the nature of our problems, and the nature of our solutions – that is, the nature of our choices, and our responsibilities. They show us how our powers of abstraction represent, in their own right, a remarkable creative force in the Universe. They do allow us to prevail, using language but also transcending it, in "the battle against the bewitchment of intelligence."

This is very good news, the best possible news — for it does offer us a path forward. We have much to build on, in the magnificent achievements of our time, built on the vast collective intelligence of centuries of learning. In many ways, it is a truly wonderful time to be alive, a time when we can enjoy immense treasures, in spite of our existential threats (for life is, always has been, and always will be, perilous). And now, as this book will argue, all these insights offer us an urgently needed road map, a new consilient and shareable framework for thinking about and responding to (being *able* to respond to, i.e. responsible for meeting) our challenges. Perhaps we can not only survive them, but thrive in their aftermath — as indeed we have done before.

THESIS



The Empire's New Clothes?

> *"The non-art-loving public at large, instead of being grateful to architects for what they do, regards the onset of modern buildings and modern cities everywhere as an inevitable, rather sad piece of the larger fact that the world is going to the dogs…. Their growing reluctance to accept the modern city evidently expresses a longing for some real thing, something which for the moment escapes our grasp."*
>
> *— Christopher Alexander, 1965*

Christopher Alexander wrote these words over a half century ago, in the introduction to his classic paper "A City is Not a Tree" — about which more will be said later. He was not the first noted architect, and certainly not the last, to observe that twentieth century architecture and urbanism had left a troubled legacy for humanity. Nor was he the only one to note that, as the research clearly shows, most people do say they are displeased by the general character of the human environment, and by contemporary architecture in particular — notwithstanding occasional retro fads and works of popular "architainment".[1]

But Alexander, the Cambridge-educated mathematics and physics student who became a seminally influential theorist at a remarkably young age, was not speaking only of aesthetic preferences, but of the actual geometric structures of things, and their part-whole relations — a career-long interest in *mereology* (a good old word) and its dynamics, for better or (too often) worse.

What Alexander pointed to, tellingly, was "some real thing" that up to then had, as he said, escaped our grasp. This "real thing" as he came to describe it, is outside of individual preference, and certainly outside of "style" as we normally think of it. Instead, it is an actual structural property, or set of properties, of the places where we live — and it is this that is too often missing in contemporary environments.

This book explores the claim that this "real thing" is now *within* our grasp, thanks to breathtaking new developments in mathematics, biology, psychology, neuroscience, network science, and other fields. (Alexander contributed some of these himself.)

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[1] There is abundant research on this topic, for example, Gifford, R., Hine, D. W., Muller-Clemm, W. & Shaw, K. T. (2002) "Why architects and laypersons judge buildings differently: Cognitive properties and physical bases", *Journal of Architectural and Planning Research,* Vol. 19, No. 2, 131-148.

I interviewed Alexander in 2002, around the time he was preparing to publish the first volume of a thick and troublesome book called *The Nature of Order,* subtitled *The Art of Building and the Nature of the Universe.* I wanted to know what he thought about new developments in the sciences, and what they portended for architecture. After I apologized in advance for a long-winded setup question, I asked the first question this way:

We're seeing some astonishing things coming out of the sciences just now. Geometry seems to be the hot topic — the complex structure of proteins, the unfolding processes of embryology, the distribution of large-scale structures in the cosmos, and so on. And there has been more confirmation of the fantastic notion that life itself is a certain kind of geometric structure. From there, it does not seem too big a leap to the assertion that consciousness, and the conscious experience of quality and value, are rooted in geometric structure as well. Certainly, recent work in the neurosciences seems to suggest this.

Of course, you have been arguing something like this for years, and developing it as the basis for what might be a more advanced architecture. You have criticized the kind of abstract expressionism that has bogged down modernism at the level of sculpture, and you have argued for a much broader and more adaptive architecture, one more rooted in the geometries of human life. The new sciences seem to us to provide a lot of fresh evidence for your assertions, and to point the way to some very promising new tools for evaluating and perfecting the qualities of a built environment, along the lines you have suggested.

You recently said you find these new geometrical insights of science very promising and exciting. What is it that you think is most exciting about these new developments from your point of view?

Alexander responded,

It's the idea that, instead of talking about architecture in traditional terms, which invite all the criticism about romanticism and about being buried in the past — all of this actually just being replaced by an emerging body of fact which establishes the substantial nature of these claims.

And that's it. He sidestepped all the business about who has the true expression of our time, who is reactionary, who is most avant-garde, or most accomplished at producing what may be (perhaps sometimes is, but surely is often not) profound art. We then see habitat for what it is, from the

outside, and art for what it is, also from the outside. We see them both as precious, important, ideally mutually reinforcing and energizing. And we see them both in a contemporary pathological relationship, and in urgent need of reform.

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These new insights also call into question some of the cornerstones of 20th century design theory: the premise that we must have an "architecture of our time" and it must be radically new and different; the unquestioned assumption that abstract art alone, executed as a series of gigantic sculptures, can ever be fitting human habitat; the prohibition against building on the genius of thousands of years of architectural and urban evolution; the imagined sophistication of primitive early 20th century engineering schemes; and especially, the now-decaying fantasy that we are advancing into a wondrous and privileged (and sanitized) future, delivering us from disease, poverty, backwardness, and all manner of other human ills. Never mind that we were also being delivered into climate change, resource depletion, ecological destruction, contamination and pollution, global cultural hegemony and homogenization, and, more insidious but no less worrying, the degradation of essential cultural institutions, and critical modes of human intelligence.

This was the world of design theory, but beneath it was a larger set of "modernist" theories of technology, culture, nature, and human nature, shared by other movements in the arts and elsewhere. They were part of a worldview that today appears naïve at best, willfully illiterate in its own history at worst. It had the hubris to imagine that ours was a pinnacle time, an arrival at a virtual utopia of technological salvation. Its failure — its bankruptcy — is now laughable, a scandal. And yet that worldview lingers on, along with its culturally spurious marketing campaign, because there is not yet a compelling alternative picture — at least not one visible from within the design world.

For many of us, unable to see beyond the evident failed promises of this modernist past, the result is now a pervasive postmodernist funk. We see its cynical results in academia, in business, in politics, in art — and in architecture. The old systems crank on, ever more profitable, ever more ravaging of the planet. But the life has gone out of them, replaced by a cynical emptiness. With it has come a remarkably laissez-faire attitude that would seem to be at odds with the fashionable but vacuous leftism of many postmodernists. Nothing is to be done, so let's not try to reform anything, let's just make art that expresses our angst over the fact that… nothing is to

be done. “Since we are not responsible,” says the architect Rem Koolhaas, “we must become irresponsible.”

In architecture, postmodernism first manifested in a return to neotraditional forms, restated between ironic quote marks. That winking game quickly grew tiresome, its cartoonish caricatures too grotesque and inauthentic, and it was soon to be replaced by an exuberant (but ever more cynical) series of neomodernist expressionisms — what the architect Peter Eisenman called the “rococo” phase of modernism, its “death rattle.” We all knew that modernism had been a colossal failure, according to this view, but now we would use the same *modernist* forms and methods ironically, fashioning an expressive art appropriate to our postmodern angst. *Clever!*

Eisenman’s protégé Rem Koolhaas described the situation well when he said, in his essay “Whatever happened to urbanism,”

Modernism's alchemistic promise — to transform quantity into quality through abstraction and repetition — has been a failure, a hoax: magic that didn't work. Its ideas, aesthetics, strategies are finished. Together, all attempts to make a new beginning have only discredited the idea of a new beginning. A collective shame in the wake of this fiasco has left a massive crater in our understanding of modernity and modernization.

So there sits architecture at the bottom of Koolhaas’ crater, seeing no possibility of crawling out, according to this view. We must be content to rearrange bits of the rubble in dramatically expressive ways. This is where we are, who we are — cynically agnostic postmoderns, content only with improvisational and situational bits of knowledge, and bits of art. Our architecture should aspire, then, to nothing more (or less) than gigantic sculptural works, a kind of art therapy, helping us to work through our psychodramas in this traumatic time.

Even deeper under this view of art, and of professional responsibility, there is an elaborate “post-structuralist” philosophical position on the constructed nature of knowledge. Unfortunately, as philosophical views go, this one is an incoherent mess. As we will see in the later explorations of incompleteness, it is naïve to believe that *any* form of knowledge (situational or otherwise) is not perennially bounded by the same epistemological limits, and yet carrying the same obligation to make difficult choices even in the face of those limits. For this reason, there is nothing admirably humble in the abdication of responsibility in the name of agnosticism, in the denial of all forms of knowledge except ad hoc, tacit and situational ones. In fact, that is its own kind of arrogance, not to mention

self-contradiction — in effect, to be dogmatically anti-dogmatic, to be a gnostic agnostic.

Such false modesty also fails to recognize that humanity is already situated within the larger historic problems caused by our failing designs and the misuse of abstractions behind them. To refuse to account for them, and to take responsibility for their repair, is to be complicit in a continuing perpetration of their human and planetary damages.

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Most of us remember well the remarkable level of hype surrounding the new millennium several decades ago. Most of us are also aware that the change of centuries is purely an arbitrary mathematical artifact — based not on natural cycles but on the simple abstractions of the decimal system, and calibrated, probably in error, to a historical Christian event. (According to the Chinese calendar, this book is going to press in the year 4719.) And yet western civilization has always defined and ordered itself according to decades and centuries. Ends of centuries have usually been historically difficult times, bringing together a rush of unfulfilled aspirations, doomsday predictions, and anxieties about the future. The beginning of each new century has often brought a release of optimism in the new possibilities verging on utopianism, and with it a synthesis of older artistic threads into new fabrics…

In the early years of the twenty-first century, it seems that the threads are more like fractured panes of glass, splitting into smaller and smaller shards… modernism… post-modernism… deconstructionism… neo-modernism… increasingly hostile factions battling and belittling one another — in art as in other fields — as idealism gives way to cynicism, ideology to mere tribalism. The role of artistic culture is challenged as never before, as powerfully complex and corrosive economic processes dominate our lives and increasingly shape our world in ways that we still poorly understand. We are left disillusioned, isolated, without direction, while the prodigious machine revs up ever higher.

The famous architect Frank Gehry summed it up this way, after extending his middle finger to a reporter who asked an impertinent question:

“Let me tell you one thing. In the world we live in, 98 per cent of what gets built and designed today is pure shit. There's no sense of design nor respect for humanity or anything. They're bad buildings and that's it."

So this is where we are. From the point of view of an environmental design professional, it is exceedingly difficult to defend the quality of the built environment created in the last half-century. An honest student of the nature of things, not blinded by one fashionable artistic dogma or another, perceives a fundamental, qualitative difference — a distinct poverty of beauty and character — that increasingly emerges with time over the span from the early Twentieth century up to now. Against the vast beauty of nature, or the humble richness of vernacular towns all over the world, almost all of the last century's work somehow compares poorly indeed. Even the supposed masterpieces, interesting exotic distractions, seem cold and lifeless, and hardly worthy general models of the future. We all feel the bankruptcy of the design regimes, and the growing ugliness of the world we are making; and unless we are marketers, or charlatans, or have become self-deluded, we cannot deny it.

As we progress into the early twenty-first century, the self-evident state of the built environment is this: simple, well-designed vernacular buildings, and the knowledge to make them, are disappearing around the world. New homes and small commercial buildings the world over are clumsy composites of throwaway fakery and schlock. The fabric of once-integrated neighborhoods has been sliced to shreds by roads and parking lots. Industrial buildings are remarkably crude and artless. Shoe-box office and apartment buildings, at best shoddy imitations of sterilized modernist memes, are creeping across cityscapes and countrysides across the globe.

Existing pre-1920s buildings and neighborhoods remain a bright spot, often lovingly restored and revitalized — but then, because they are increasingly scarce, they become colonies of the wealthy. In any case, they are regarded as relics to be preserved in amber, not learned from or built upon.

For their part, so-called new traditional designs are too frequently crude and artless. It seems the knowledge required to make them well has been lobotomized, a casualty of a totalizing ideology of "starting from zero." This goes back at least to Gropius, who gutted the Harvard curriculum of its treasury of the past — perhaps the first instance of "architectural cleansing" — soon to be folowed by almost all other schools globally.

The result is that today, the frequently feeble attempts to build on the genius of the eons are barely tolerated by the design leadership, mostly ignored and left to the backwaters of schlock culture. We can look the other way while a few rich people build their neoclassical palaces, and the suburban builders paste on their trad fakery. The New York Times architecture critic Herbert

Muschamp put it this way, speaking to laughter and applause at the Art Institute of Chicago in 2000: "I know it's important to be aware of what's going on in suburban America, but you know, who cares?"

This is a long way from the aspirations of earlier generations to lead the culture of building toward a better future. (Think of the Arts and Crafts movement, or Gustav Stickley, or the early Wright, or innumerable others). As postmodernists, they cannot: again, their fundamental position is situationist and laissez-faire. They can only attack others, and sulk, and give the finger to impudent journalists (as Gehry famously did).

To be sure, there are some people who actually believe that the dismal state of our built environment doesn't really matter — that the twentieth century's undeniable advances in living standards and medicine and technology are far more significant than what they regard as the mere external appearance of the machine of society. Of course, it would be nice if our buildings were prettier, but that is really only a matter of cosmetics.

Some of these people, incredibly, are architects. For them, a few rare pieces of fine art amid the general mess will have to suffice. (Perhaps Gehry is among them, in the end?) And perhaps they're right — perhaps it doesn't matter whether we experience a simple rich beauty in our routine daily lives, whether our buildings complement or desecrate the beauty of the natural environment, whether our civilization is shaped, as, say, Athens was in the time of Pericles, by beautiful, durable and elegantly functioning architecture, ennobling civic and public life.

Perhaps the way we shape our built environment has no relation to the way we shape the natural environment. Perhaps the unsustainability of our buildings has no relation to the unsustainability of our future.

But there is growing evidence to the contrary. In particular, there is impressive evidence emerging from the sciences that what we call beauty, that concept so subjectivized and relativized and commodified in our own time, is, in some deep sense, an experience of recognition. In the presence of what we call beauty, we recognize a form of natural and biological order that is important, even essential, for the conditions of life, health, and well-being, for humanity and for the biosphere.

More precisely, the evidence indicates that the experience of beauty is firstly an important indicator of beneficial environmental conditions, and secondly a highly beneficial human experience in its own right. It is also plastic and extensive, and it can certainly differentiate into esoteric realms, and explore

arcane corners of human experience and individuality. (And there is surely an essential place for such grand adventures within the arts.)

But we must not lose sight of its common roots in our shared biology, and our common humanity. For increasingly it is clear that this shared notion of beauty must be the basis of a healthy co-created public realm, a healthy city or town, healthy citizens, and a healthy human ecology. Whatever else we do, we must recover this ordinary and common shared sense of health, of healing, of the whole, of the commonweal. The contrary is illness, unsustainability, and death. That path lies before us now, if we do not change directions.

Here is another way of wording the imperative: we must stop spreading ugliness throughout the world. This ugliness is a manifestation of the same kinds of dysfunctional structures that are destroying the world, for reasons that are not incidental. The fragmentation of modern planning and design, its sterility, its idolatry of the abstract, its blind mechanization and encapsulation, its "decontaminated sortings" to use Jane Jacobs' apt phrase — these things are environmental toxins, and human toxins. So too are the outmoded ideas behind them.

And yes, they produce ugliness — and that is no coincidence.

Reductionism is the gift but also the curse of our species. We see parts of the world with astonishing precision, but the views are like those through soda straws, lacking the larger picture, or inevitably leaving large blank regions. Then we can take the world apart into little pieces, and put them back together again in all sorts of interesting and powerful ways. But of course, sometimes we have trouble getting all the pieces to fit back together — like the mechanic who discovers a few extra pieces after the car has gone back together. Then we hope that it doesn't matter — perhaps the car will run OK after all. Or perhaps it will run a little too well — perhaps we will find ourselves like the aforementioned Sorcerer's Apprentice, having unleashed something we cannot understand or control.

Or perhaps our parts are not the kinds that work in simple assemblages of linear function, but depend instead on a more complex relation of transforming parts that are "interrelated into an organic whole," in Jane Jacobs' apt phrase. When we put together the parts of a cow, even in the right places, it is still not likely to go "moo." We need the transformational *processes* too.

In most cultures throughout history, our reductionist treatment of the built environment would be regarded with dismay. Churchill's famous remark that "we shape our buildings, and thereafter they shape us," would have found little disagreement before the Second World War. It is only in our own "modern" era that the beauty and elegance of buildings has been seen as so much sugar-coating over their utilitarian function, their engineered assemblages. Perhaps we can force ourselves to see the utilitarian as its own fierce kind of beauty, and that will have to do? So the architectural arts have had to settle for a game of catch-up, accepting the utilitarian dictatorship but trying to make it the basis of their own dignified art form — "house as machine," and other dubious projects of the sort. Then they become mere marketers and branders, consuming their own vapid theories and rationalizations.

To be sure, in the last millennium we have made wondrous if imperfect achievements in establishing democracy, open society, human rights, the rule of law — achievements, we should remind ourselves, once widely dismissed as impossibly utopian. We have seen an explosion of commerce and technological creativity. Yet in an era when it seems that anything is possible, it seems ironically that the only thing that is not possible is a kind of connectedness and wholeness amidst all of this disconnected stuff — an integrity, a genuineness. As Edward Sapir noted (all the way back in 1924), we seem awash in "spurious culture," and lacking some essential ingredient of a "genuine culture." Did it ever exist in the past, or are we feeling nostalgia, as some claim, for a past that never was?

By our standards, pre-modern cultures were brutish and scientifically ignorant; yet it is easy to feel an admiration bordering on jealousy for the coherent beauty of their art and their built environments. Through the eyes of an intelligent anthropologist, we can look all around the world through the ages, and we can indeed find that same coherence and beauty. Science does tell us that we are missing something, that we have lost something in the bargain. Alexander's observation was correct: the observant student of design history cannot escape the impression that we stand in time and place as an island of the dysfunctional and the spurious. The more we try to copy the genuine, the more we seem to destroy it, and the more fraudulent our efforts become. Then we quarrel with one another over our mutual forgeries.

Or, like Adolf Loos (and his countryman Hitler), we decide to go all in on our psychosis of supremacy. We stand at the "pinnacle of mankind," as he proclaimed, the most arrogant of neocolonialists, rationalizing that our self-inflicted aesthetic incompetence is merely a sign of our technological

advancement and not a sign of deeper cultural dysfunction. Then we set ourselves up for self-delusion, and in due course, self-destruction.

The effort to find a mathematical explanation for what is beautiful and good is of course one that has stretched back thousands of years, spanning the works of Pythagoras, Plato, Vitruvius, and many others. In the twentieth century, we came to believe that the question of what is beautiful and good is completely relative and even meaningless. The real explanation we sought was for what is rational, what is functional, what is logically ordered. And we felt that in answering it we had arrived at a kind of utopia. We embraced our abstractions, our machines, our crystalline pure geometries. We felt that we were above time, above history, beyond the messiness of the world. We had arrived at a wiser, purer age. We were modern!

Looking back, we seem more like childish teenagers pretending to be adults, putting on ill-fitting clothing — or perhaps early twentieth-century fantasists, envisioning a ridiculous spandex future. The trouble now is that we have actually built a dysfunctional simulacrum of that fantasy — dysfunctional, that is, in the ecological ways that matter most. In other more limited ways, it functions only too well.

So it is past time to formalize a more mature understanding of design, one that learn from the sciences, and from their insights — for example, about the workings of deeper processes of human societies, their economic and technological and logical forces, and the game theory dynamics of those complex systems, with their sometimes perverse outcomes. The refusal to account for these forces, and to seek to guide and correct them when necessary (as an earlier generation of architects certainly did) means that we relegate ourselves to mere art supplies for the technocracy — useful idiots who can play a profitable role as packagers, themers and branders, on the road to species hell. If we get to feeling too guilty, we can reassure ourselves with our postmodern cynicism. “What else can we do, but sell out?” Lots, as it turns out.

At hand now is a larger map that can guide us (imperfectly but sufficiently) through this time. It is the picture we are learning about the structure of the Universe and its natural systems, including human nature, human history and human technologies, seen through the lens of humanity’s science. Nature is still the great teacher, because it gives us a larger lens on our own problems now, and the paths beyond them. That is enormously hopeful.

Of course, this thesis like any other is open to debate, critique, and examination by the evidence. Accordingly, we will consider evidence in the

following sections. Of course, what is presented here is just a brief introduction to what has already emerged, with more arriving regularly. However, I do think enough has been established to prove the case, and moreover, to provide the hopeful basis for a new direction — perhaps even a renaissance — in the discipline of architecture specifically, and in our cultural architectures more generally. And just now, this is a most necessary renaissance.

As the twentieth century recedes into history, we have been deeply humbled by our failures, by the revelations of the depth of our ignorance that the new sciences have brought. But that itself is a crucial bit of self-knowledge, as Plato himself would have counseled. And now it is time to set about the humble task of applying the old lessons of history and nature, and the new and burgeoning lessons of mathematics and the sciences, to an exploration of a richer and more satisfying architecture. After all, it's a new millennium.

EVIDENCE