The DNA of Place

An introduction to the topics of local identity and heritage, and their continuing importance for the human environment

How to Use This Module

This is the fifth e-learning module for a series of courses in urbanism, architecture and building crafts known as the "European School of Urbanism and Architecture." The programme was designed for new students to the study of urbanism and building, and for professionals and practitioners who wish to increase their level of understanding of important new topics in best practice. More information in this programme is available at www.esua.org.

If this is your first time learning about this subject, and you find this module interesting, you will have the option to take more modules on line in the future. But this on-line element is really only a part of the full course of study. This module is designed to be integrated with a hands-on learning programme that will allow you to learn in the most effective way known: "learning by doing." You will have the opportunity to participate in field studies of actual projects, working alongside leading practitioners, and using the latest tools and techniques.

This module is specifically designed as an introductory course for those coming to study in the programme, but may be taken by others as well. The full project-based curriculum is now in the pilot phase, and is planned to be launched as a full-time programme after several years of development. You can learn more at www.esua.org.

Each e-learning module begins with a short reading, and then gives you links to additional reading. The final examination includes a short multiple-choice section, and a written essay portion that you can enter through a form, or email to the course instructor as a text document.

Introduction

Every act of building destroys something that came before. At the same time, perhaps paradoxically, almost every act of building incorporates some of what came before too. How are we to understand the relation between these two apparent opposites? How are we to balance them in practice?

In particular, how important is it to retain and to build upon aspects of what came before, as a unique expressive pattern of a local place?

Many contemporary methods of design and building emphasize the new aspects of what is built – the promise of innovation, the hope of improvement, the removal of what was painful, or what is simply no longer valuable. Indeed, modernism as a design movement

– the dominant movement of the 20th Century, which is still highly influential - has contained within it a powerful impulse to celebrate the new, and to sweep away the old. In turn modernism recognised and sought to celebrate the fact that technological innovation, in itself, often generates its own "creative destruction," sweeping away what came before so as to allow for rapid growth.

But of course, this can be very dangerous. As we have seen over the last century, the promise of the new can be unfulfilled. What we regard as outmoded may simply be temporarily out of fashion, but may return to offer a stronger, more enduring value. The problems we associate with particular existing structures may in fact be repairable, while the promise of a new start – a "tabula rasa" – proves an illusory fantasy, lacking the richness of a real place, and the quality of what came before.

In a global age, this problem is compounded. The latest internationally fashionable architecture can become dominant, taking the place of locally differentiated architecture. The result can be a language of architecture that has no particular relation to a given setting, or worse, has highly incompatible features. As one notorious example, we can get buildings with extensive glazed curtain walls in hot desert regions. Therefore this can be a very serious obstacle toward the goal of more sustainable settlements.

Moreover, there is reason to worry that this homogenization can prove highly damaging to the heritage and local identity of such places. The meaningful and cohesive urban pattern that has grown over centuries can become fragmented and degraded. This is not only a cultural concern, but equally an economic one: it may severely damage the ability of such places to attract and hold viable economic activity, such as heritage tourism.

The damage can also be ecological. Instead of locally available materials, such buildings may rely upon imported materials with high levels of "embodied" energy. While some imported materials may appear to be long-lasting, maintenance costs may be high, and require more imported materials. Because the global architecture generally takes an iconic, sculptural form, the ability to be modified and adapted to new uses can be highly constrained. There is also evidence of a poor ability of materials to wear well over time, and to continue to be regarded as attractive, desirable and worthy of care.

Lastly, there are questions about how well such buildings perform in supporting a coherent and sustainable urban fabric -- one that allows neighborhoods that are more compact, walkable, mixed-use, transit-served, and sustainable on other metrics.

We have seen many such failures over the last century, and the results have been impoverished environments for human beings – at best degrading the quality of life for those living in them, at worst having to be torn down mere decades after being built. This is of course the antithesis of sustainability. Moreover, on some level, it is a failure of our professional duty to make the built environment an increasingly better place.

Today, in the age of sustainability, we cannot afford to repeat such failures. While we cannot hold onto the past, neither can we afford to throw away valuable treasures whose

replacements are, on the face of evidence, inferior. We need a more intelligent combination of the old and the new. We need vibrant, attractive, efficient, low-carbon places, that will promote the well-being of our clients, and of the community as a whole.

Today we have new understanding of the enormous economic value of heritage structures – for example, for tourism and business recruitment - and of their other qualities. We have a growing appreciation for the social and ecological benefits of many heritage structures and patterns. And we have a new understanding of the value of building on context, within the architectural context as well as the context of nature and ecology.

Such lessons come home most powerfully in the recovery of areas damaged by natural disaster – for example, areas hit by earthquakes, hurricanes or tsunamis. In these places there is an urgent need to rebuild quickly, and to incorporate new technologies that are more resistant to natural disaster in the future. This can translate into inferior, unsustainable architecture, that degrades the overall quality of the built environment. But with the right tools and approaches, evidence shows, this need not be the case.

This module will discuss these insights, and their implications for our work to shape the built environment.

The Lessons from Biology

> *"People used to say that just as the 20th century had been the century of physics, the 21st century would be the century of biology... We would gradually move into a world whose prevailing paradigm was one of complexity, and whose techniques sought the co-adapted harmony of hundreds or thousands of variables. This would, inevitably, involve new technique, new vision, new models of thought, and new models of action. I believe that such a transformation is starting to occur... To be well, we must set our sights on such a future."*
>
> *- Christopher Alexander, The Nature of Order*

The science of physics describes well the ways in which bodies interact in a space. If we have two billiard balls on a table, we can describe their motions and dynamics in relation to one another very accurately. We can also remove the two billiard balls and replace them with a new pair, and describe their dynamic relationship in an identical way, with equal confidence. It isn't important that the white ball is a different white ball; with respect to the mathematical pattern of its relationship to another ball, it is interchangeable.

But in the realm of biology, things are usually much more complicated. At any given point, we are generally dealing with a structure that exhibits evolutionary complexity. There is a kind of "tissue' of growth, containing an organic web of connections that is in fact far more important than the constitution of the elements that make it up. Indeed, few such elements can be isolated in an elementary or mechanical way, without a profound effect upon them, and upon the system in which they are embedded.

Here is a simple example that illustrates the point. If I am working on a car built of standard parts, I can take the car apart and re-assemble it, and it will very likely run perfectly again. But if I take apart a cow, and then stitch the cow back together, I find that it will not "moo" again. In the process of disassembly, I have destroyed a complex web of adapted connections – a structure on which the life of the system depends.

Surgeons do indeed sometimes replace organs with other organs. But they must do so with the greatest care to continuously maintain the integrity of the organism, and the function of all the other organs during the process – often with highly complex secondary procedures and technologies. They must take the greatest care with tissue matches, blood types and other contextual factors. And they must adapt their own procedures carefully and continuously to the health of the patient – the heart rate, gas absorption, temperature and many other factors. To do this they are making constant adjustments, and constant adaptations, to the health of the patient.

In the built environment, it now appears that something not so different is going on. Parts of a city do indeed grow in adaptive equilibrium with others, and we cannot just sever some aspect without threatening the vitality of other parts. The city is not a machine, in the sense of being a collection of interchangeable parts. It is much more like an organism – contextual, interconnected, and in a sense, living. In any case, it is certainly an extension of our own living processes – and as we are now learning, it can have a profound effect upon our own health and well-being.

One of the characteristics that a city must adapt to is its unique location: its climate, terrain, views, vegetation, materials, culture, and so on. All of these together produce a strong local identity – a unique set of qualities for that place, forged of a unique set of local conditions. This local identity is not a mere appearance, but a reflection of the city's adaptive processes - the very things that make it vibrant, successful, and alive.

The natural setting is often the most obvious component of local identity. Consider, for example, Rio de Janeiro with its striking beaches and Sugarloaf Mountain; Venice with its lagoon setting; San Francisco or Vancouver with their powerful waterfront backdrops. But there are other, more subtle aspects of local identity too: the colors of the terrain and vegetation, the smells of flowers and plants, the sounds of birds – all of these make a unique mix, which is further compounded by changes in the seasons, and other changes over time. The resulting pattern is exceedingly complex, and as unique as a fingerprint.

Even more complex can be the cultural response to these natural factors: the characteristic materials, colors, features and details of the buildings and spaces; the activities of people, as they go about commerce, recreation, festivals; the aromas of cooking, the sights and sounds of urban bustle, the sounds of one or more languages.

Because this is such a dynamic pattern, much of it is constantly changing. Yet much of it is not changing. Moreover, the way in which it changes is not one of mere ***substitution*** but one of ***adaptive evolution***. We will explore what this means – and why it is important to adjust our methods of thinking and action in response.

The Problem of Modernity

But modern technology often presents a problem. It is largely dominated (or has been, until only recently) by methods that are standard and interchangeable. This has produced great efficiencies, and great economies of scale: we can have large centralized factories, making the same standard things, going together in standard ways, regardless of the local context. This strategy has great advantages – particularly in the ability to generate large quantities at reduced costs. But it also carries severe limitations and risks, as we now see.

One of the most obvious results of modern methods of production and commerce is in the homogenizing effects of globalisation. City centers around the world are virtually indistinguishable – down to the ubiquitous Starbucks that looks and even smells the same, in New York, Beijing or London. Many new buildings seem to have little to do with their local context, and much more to do with the current artistic interests of an internationally active cadre of architects.

But other than presenting an odd sense of discord, is this really a problem? After all, globalisation has been with us at least since Genghis Khan and Christopher Columbus. (Tomatoes were not native to Italy, nor was tobacco native to England.) Many of the sights, sounds and smells we associate with a particular place today in fact originated elsewhere. If we wanted an authentic local architecture for the Northeast United States, perhaps, we might insist on Algonquin lodges. (Though they too were likely derivative of Asian structures of millennia past!)

Thus the critical factor is not whether an element originates in a local context, but whether it has come to be adapted, through an evolutionary process, to the other elements of the local context. That is, it must be mutually adapted to a number of other variables working synergistically in a system – the characteristics of an ***organic structure***. And it must achieve this through ***adaptive evolution***.

It turns out that this capacity for adaptive evolution matters a great deal, because it is through such adaptations that a given element of a society becomes integrated and optimized. Thanks to the insights of evolutionary biology, we now understand that it is through such a process of responding to what came before, evolving mutations, and adapting them to fit, that structures can self-organize into highly efficient, ordered and successful structures. It is through such a process – and not merely the works of a few geniuses - that the great cities and other great artefacts of civilisation came to be.

As we discussed, it is a central characteristic of modernity that it has been reliant on a kind of technology that is much more elementary than this organic kind of process. It has been based much more on the standardisation and replication of parts, and the production of large quantities. (Remember the example of the car.) As noted, this is indeed a very powerful form of technology – but if it is not coupled to adaptive processes, we may find that we begin to suffer very serious unintended consequences. We may, in fact, be headed for a global crisis. There is reason to think this is indeed the predicament we find ourselves in today.

Two kinds of technology: Linear, and mutually adaptive

Consider two different models of technology. (In practice they can be and are often mixed, but for these purposes we will consider them separately.) One is what we may call "top-down" – it identifies a goal, then determines a sequence for implementation, and then proceeds in a categorical fashion: first the larger steps, then the smaller steps, then the final, smallest steps.

This is a hierarchical model – one that proceeds in a pre-planned, linear progression from larger to smaller to still smaller categories of action. There is no "backing up" and returning to modify steps. There is no "overlap" that allows one set of steps to affect another parallel set. Everything is planned ahead to be neatly contained within its categories, and to proceed according to the plan.

Another model might be called "bottom-up." It allows modification of steps at any point, in response to what is encountered. The elements of the steps can adjust to one another, and to what is found along the way. The smaller steps can even result in modification of the larger steps, based on what is found. The plan itself can change and evolve.

Moreover, what is found in one set of steps can affect a neighboring set of steps. The steps do not sit within planning "silos" but, in effect, "talk to each other" and allow mutual modification.

It turns out that many processes in nature, including most of the activities of cells within the human body, operate in this way. The cells that grow into the various tissues of the human body are not directed by a central blueprint, but follow a process of differentiation based on recipe-like instructions for responding to contextual clues.

Some other processes in nature are more like "top-down" processes: they impose a structure wholesale on the landscape, and then impose articulations from within that structure. The most obvious example is a crater formed by a meteor – a single dramatic event that is quite literally "top-down" -- which is then followed by complex processes of erosion, formation of streams and so on.

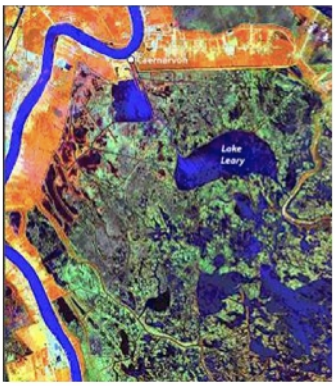
Many processes in nature combine both top-down and bottom-up aspects. For example, as a result of a flood, a river might cut a new channel through a delta area, leaving an island of silt – a top-down kind of process. Then vegetation might grow up on the island, in a chaotic, bottom-up way. Thus the overall structure combines both aspects.

Top down, and bottom up: stream channel, and trees

Humans have exploited the power of linear and hierarchical processes in our modern technologies, achieving great levels of productivity and economies of scale. We have paid less attention to the power of adaptive evolution, and indeed we have only recently begun to understand its high problem-solving capacity and its many other advantages. But in fact we have exploited adaptive evolution in many

of our traditional technologies – which turn out to be more sophisticated and potentially useful than we had recognised until very recently.

Consider the following two examples from human engineering practices. In the Mississippi Delta of the USA, shipping navigation was cumbersome, so engineers proceeded to construct a series of razor-straight canals through the delta. These were thought to be rational and superior to the "messy" conditions of the marsh. But in fact the marsh represented a highly complex ecosystem, with much adaptive ability to handle storms and other stresses on the system. They were in fact ***resilient*** systems – able to manage stresses.



So when Hurricane Katrina came in August 2005, the canals had destroyed the resilience of the delta. There was no longer any capacity to absorb storm surges, or protect trees against intrusion of saltwater, or do any of the other complex jobs that the delta had done. The result was a virtual "hurricane highway" that allowed Katrina to sweep into the heart of New Orleans, and very nearly destroy one of the world's great cities.

Note that it would be relatively easy to plan the canals that cut through the Delta. It would be much harder to plan the complex pattern of meanders and vegetation and other elements that form the Delta itself. It would be like trying to plan the structure of a very elaborate plant. Of course what nature does is simply to grow the pattern, without conventional top-down planning.

A second example comes from Asia, and the terraced rice paddies that are common on many steep hillsides in the Philippines, Vietnam and other countries. These paddies are quite complex, and they are built without conventional plans. Instead they are built in a stepwise process that follows the natural contours, and maintains a manageable wall height. They are then continuously repaired and maintained. The result is that these structures are very resilient and long-lasting, with careful maintenance over time. It can also be seen that they are very beautiful.

This engineering process may seem on the surface to be more "primitive," but in fact it is not. It is made up of many small step-wise adaptations that form a highly ordered, responsive and resilient pattern.

The latest technology is beginning to learn these lessons. As we discussed, medical procedures routinely follow such stepwise adaptive processes. The design of Boeing 777 aircraft, though standardised between planes, relied in its development upon a stepwise adaptive process in which engineers using virtual reality goggles and gloves crafted the fit between some complex parts of the aircraft. The field of biotechnology has also had to rely upon stepwise adaptive processes. This is a promising and exciting new trend.

Mutually adaptive technologies in cities

What are the lessons of these insights for cities? First, such adaptive evolutionary processes have already been at work, and have helped to produce – along with more top-down methods – many highly complex, highly functioning cities throughout history. Secondly, as the above examples from medicine and aircraft design illustrate, such adaptive technologies are still available to us today – and indeed, they hold out great promise.

Consider examples from so-called "primitive" medieval cities of the Islamic world. At first glance they may seem to be a chaotic jumble of tangled roads and lanes, with no order behind them. Closer inspection reveals a highly ordered pattern of connectivity, with a distribution of lengths of roads – not unlike the highly ordered patterns of veins, arteries and capillaries in the body. Similarly, the pattern of shops and other facilities follows a remarkably ordered sequence of optimal distribution, without much planning.

Sidi Bou Sa'id, Tunisia

What of the buildings themselves, and their features? Here again, the gifts of adaptive evolution can be seen in the traditional processes of development and refinement over time. We can see surprisingly sophisticated features that help to cool or shade buildings in hot climates, create privacy and quiet in the middle of dense cities, or create opportunities for social interaction and commerce. We can see an evolution of beautiful designs for buildings and elevations over time, that help to make the city a more attractive, livable place. (That they aim to show off their owners' good taste is also a common motivation.)

Harvesting Local DNA

Many people – including architects - assume that the unique features of a particular locale are purely the result of cultural conditions, expressive intentions, political realities, or even philosophical worldviews. But this is to reduce architecture to a purely semiotic (symbolic) act - a kind of making of codes. Of course it is much more than that. It is, in fact, the embodied pattern of adaptation to many complex factors, of which distinctive cultural or political expression is only one. Others include climate, terrain, materials, available building technology, and, of course, essential human needs, as they play out in a given set of conditions.

For example, humans must be comfortable within a thermal range. In some very hot dry regions, heavy masonry buildings with small windows do a relatively good job maintaining thermal comfort without modern technologies. In other, temperate climates, it is more important to open the buildings up to natural ventilation. The colonnades of Bologna maintain thermal comfort in a warm and sunny climate, while they would be dark and dank in the climate of, say, Sweden.

Social spaces like the colonnade must adapt to the thermal factors of a region, as well as to the particular social conditions. The front porch of the American South is a sophisticated layer of semi-public space that helps to connect a house to the street, to promote social interaction between neighbors, and to promote cooling of the house.

But some critics believe that the porch is only an expression of a particular social and political mindset – specifically, that of the Ante-Bellum South, in which white plantation owners maintained African slaves to tend their crops. Some favor the end of the porch, as an act of revolution and severing of ties to a painful past.

But the question for these critics is this: are architectural features nothing more than a kind of "flag" to signify a certain mindset? Do they have other, important properties – useful in solving the problems of human beings living in settlements, and even remaining useful across different eras? Are these properties useful even today in returning to a lower-carbon, relatively high-quality form of urbanism? Increasingly, the evidence suggests, the answer is yes.

For many people, this is a matter-of-fact proposition. You find something that works, and you re-use it. But for reasons we will discuss, this is a troubling notion for many architects today.

But what about the dangers of historicism?

"Historicism" is the term that architects and critics use to describe architecture that seems to copy that of a previous age. This is one of the most contentious, and sometimes oddly emotional, issues within architecture today. The term is most often used as a pejorative, to suggest that such architecture is inappropriate.
It is true that there is often little reason to replicate the architecture of a previous era down to the finest detail. But history is full of "revivals" – eras in which a previous

language or style of architecture has returned, and usually, added new adaptations (new materials, technologies, features – e.g. glass windows, electric lights, etc). Indeed, many of the most loved and successful cities of the world – Paris, London, Rome – did create buildings in a revival of styles that were, at the time, many centuries old. If this strategy was so successful then, why would it not be successful now? We must find evidence for such a bold categorical assertion.

Moreover, such places are still demonstrably successful today – accommodating many modern businesses, and many residents (including many architects) living a modern lifestyle. These places have sustained for many decades or centuries. They are successful, and they solve many problems of people living well together in cities. Does it really make sense for us to declare that "we must never ever build anything like them again?"

Why, exactly?

Some architects and critics say that this is because we now live in a new age, with new technologies and new ways of living. True, but every age is in some sense "new," and often introduces new technologies, and changes in the way people live. History is full of the introduction of new technology, which usually gets absorbed easily into the existing architecture. The invention of glass, for example, or electric lights, did not require a new architecture – but they did allow architects to explore new possibilities within the classical and traditional architectures that already existed.

As we see even today, many old buildings have indeed accommodated new technologies like lighting, heat and electronics very well, and new buildings in the same architectural language have been able to integrate them easily too. There is simply no evidence that such buildings can't be retrofitted, and abundant evidence to the contrary.

What of the notion that new technologies must be allowed to shape new architectures – for example, the ability to cantilever on steel beams, or to build exotic new shapes with reinforced concrete, or to open up walls with full sheets of glass? It is indeed wonderful that such new possibilities exist, and that some are willing to explore them. But it doesn't follow that therefore everyone must live in buildings structured this way. That would be a kind of technological determinism – suggesting that if a technology exists, then it must be used.

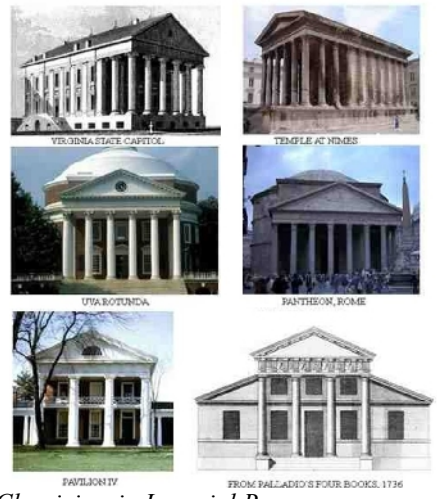
An evidence-based approach suggests that if a new technology exists, it be tried out – and the results should be carefully assessed, and integrated into standard ways of doing things with careful trial and error. From an evolutionary point of view, we should resist wholesale, radical replacements of one entire system of building with another. Nature is incremental, and there is a good evolutionary reason why this is so. It allows careful testing and refinement, and greater chance of success.

What of the notion that architecture is an expression of political realities, and the new modern reality is more democratic and more plural – and thus, it requires a new

architecture, modeled on these democratic ideals? But again, this is a reduction of architecture to a kind of flag-waving semiotics.

Moreover, it is a simple-minded semiotics, that suggests that one thing can only represent one idea. We now know that this is not at all the way that language works. And in architecture, we know that it is an absurd notion to suppose that, say, Classicism can only represent empires and dictatorships of a particular sort --- as some extremist critics have argued.

Within the world of Western Classical architecture – which is only one form of traditional architecture in the world today - we can find a breathtaking array of political systems and attitudes (and a similar range of cultural and technological circumstances). The politics ranged from Athenian democracy to Roman Empire, from the bourgeois world of the Renaissance to the Communist society of Josef Stalin, from the German fascism of Adolf Hitler to the American democracy of Franklin Delano Roosevelt.



Classicism in Imperial Rome, Renaissance Italy, and Democratic America.
Courtesy Dino Marcantonio

Modernism, too, spanned a similar range, and could be found in Socialist Germany, Fascist Italy, or modern corporate America. Le Corbusier, the pioneering modernist architect, was a collaborator with the Nazi-controlled Vichy government of France, and lectured in Rome by appointment of Mussolini.

So it is simply not true that a particular form of architecture is limited to a particular historic or political era. The truth is far more complex – and happily for us, far more liberating. We are free to choose the best solutions, from whatever source.

Modernist “pastiche”

But what of the objection to the notion of “pastiche” – that in making such a choice, we will inevitably indulge in a clumsy amalgam of previous styles or design ideas, which must be an inauthentic response to the intrinsic requirements of the design problem?

The trouble is, this is a highly selective notion, usually used to defend a particular ideological view of the “right” form of architecture for modernity. It is quite true, a design needs to be a well-adapted fit to its users, their physical needs, and their needs for art – and as we have argued here, also their local context, its terrain, climate and so on.

But what of the form of architecture that is usually proposed as the answer to this problem of “pastiche” – modernism and neo-modernism?

Many schools of architecture today, and many architects, happen to favor this form of architecture. The reasons are beyond the scope of this module, but they have to do with what is assumed to be a truly authentic response to the means of production, the materials available, the technology, and so on. As noted, there is a fear that there is something deeply inauthentic about reviving the architecture of a previous era: after all, we live in a different age, calling for a different kind of architecture.

Perhaps the answer to that proposition is, yes and no. Many things have changed, it is true – but many have not. The sun still rises in the morning; humans are still in need of thermal comfort (at about 21 degrees Celsius); we need social contact; and so on.

Moreover, with a bit of logical investigation, the attack on "pastiche" can be seen to lack a sound logical foundation. Take, for example, the work of the highly influential modernist pioneer Le Corbusier, who argued perhaps as forcefully as anyone for a "new architecture" -- casting off the old sentimental forms, and embracing a rigorously scientific, functionalist approach.

But did his work actually embody this bold prescription?

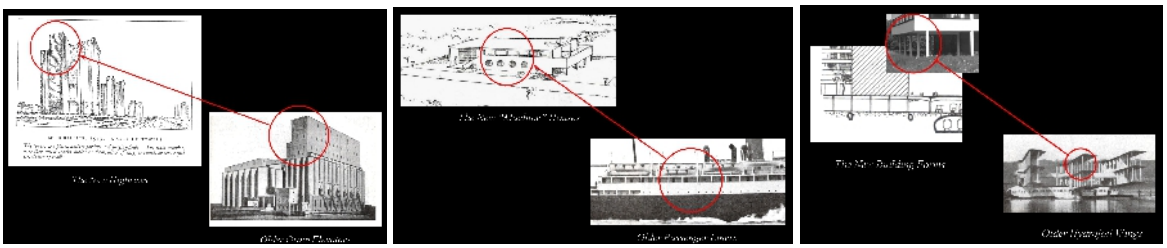
No, in fact it did not. In his highly influential 1923 book *Towards a New Architecture,* Le Corbusier appealed quite openly to the coldly rational vertical forms of American grain elevators; the simple portholes and flat decks and other minimalist forms of cruise ships; and the rows of struts and sleek lines of biplanes. He argued that these forms must be incorporated into all new buildings, and he formulated these into his later "Five Points Towards a New Architecture." There he argued for buildings raised up on stilts or "pilotis," like the wings of aircraft; for roof decks like the decks of cruise ships; for lightweight walls hung from the sides of buildings, like the lightweight panels of ships and airplanes; for ribbon windows, like those of cruise ships; and for flexible interior spaces, like those of an industrial warehouse.

Was this a rigorous standard of functionalism? In fact it was a remarkable form of romanticism – not of nature, as had occurred in the previous century, but now, of industry itself.

Why should buildings or humans be tall, like grain elevators? This problem is unrelated to the functional requirements to store a grain of rice or wheat over many months.

Why should buildings for humans be sleek and lightweight, like cruise ships? They are not in motion, and the functional problems are quite different.

Why should buildings for humans be sleek and minimalist, like a biplane or a cruise ship? Again, the latter are in motion and must conserve both weight and drag. A building has no such requirement.



From Le Corbusier, Towards a New Architecture *(1923)*

We may decide that such buildings are highly appealing, aesthetically speaking, and want to have them in our midst. That is a legitimate desire, of course. (Depending on what we do to the environments of others in the process, and whether we violate their rights or the quality of their world.) But this is not the same thing as saying that such buildings, and the aesthetics they represent, are necessary, inevitable, and required.

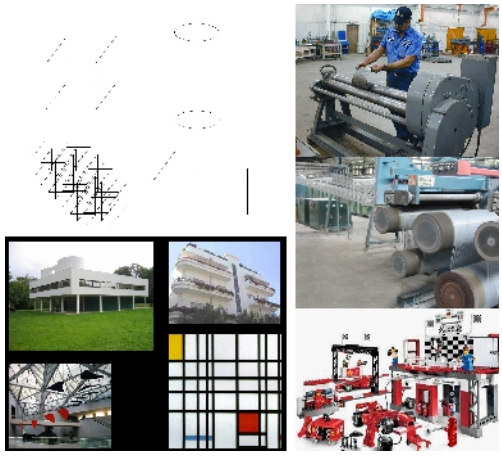
For at their core is an aesthetic preference. In the case of Le Corbusier, this preference took the form of a romantic idealization of the new industrialism. It was a moving artistic celebration of the new, the liberating, the rational, and the technological. But we now see that it was not, as claimed, a logical, scientific process of determining design.

Elsewhere, Le Corbusier seemed to revive much more ancient forms, such as the traditional "baumettes" of southern France in his Chapel at Ronchamps. Perhaps there is little reason to object to such a practice. After all, the chapel at Ronchamps is a successful building, reflecting its site in a strong way. That it also echoes an ancient French building perhaps gives it all the more strength of local and national identity.

Of course, this practice of revival is a time-honored one. Many of the most successful and most-loved cities around the world are full of revivals of earlier traditions and languages of form. The cities of London or Paris are unimaginable without the revivals of Christopher Wren and many other architects. The Renaissance itself was of course a daring revival, beginning with the radical ideas of Brunelleschi and others.

Moreover, these places are still highly useful today, and arguably they offer greater evidence of genuine sustainability, for the simple reason that we can observe that they have actually sustained. They are often durable, well-loved, and relatively low-maintenance (when cared for properly over long periods). They seem to meet human needs even today very well indeed.

Of course, modernist architecture has been very successful as a system of production around the world. It was indeed a successful expression of then-evolving methods of production. The processes of casting, rolling, sheeting, stamping, slicing and bending, were highly influential in forming the shapes of cruise ships, grain elevators and other forms that Le Corbusier and others admired.



The form language of modernist architecture was rooted in the industrial technology developed in the early 20th Century: slicing, rolling, extruding, stamping, etc.

The aesthetic qualities of modernism, in its many varieties and revivals, now take their part as historic contributions to the languages of architecture. They are available to designers to deepen the poetic qualities of space, and to express serene minimalist characters. They surely enrich the possibilities of architecture.

But few can now argue that the current industrial technology determines the architectural style that we must have. Technology has become more elastic, and there is no longer reason to argue that technology must limit us to certain geometries today. Indeed, there is reason to suppose that technology is taking us in the direction of living systems, and their adaptive responses to the environment. As we have seen, there are surprising echoes in our history. Perhaps it is in this direction, only partly explored, that a sustainable human future lies.

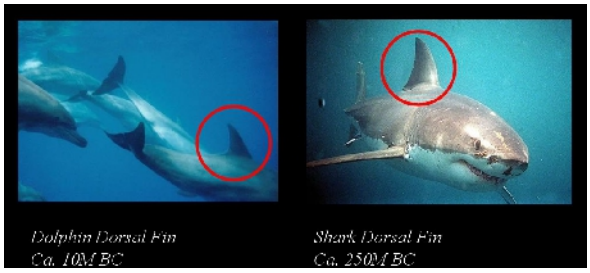
Thinking through to a more evolutionary approach

These discussions remind us again of the dangers of thinking poetically and metaphorically, and regarding problems of the built environment solely as problems of the expression of ideas, aspirations and sentiments. Of course, they have that aspect, but there is much more at stake. In the end, acts of building are acts of nature, subject to the same merciless laws of success or failure, adaptation or extinction. And they incorporate and affect all the other problems of human life – economic, social and environmental.

This problem is particularly acute when architecture is seen almost exclusively through the lens of fine art. But in an age in which sustainability is paramount, we now begin to see that we must take a more rigorous, evolutionary approach; and our art must weave itself within this matrix. It is hubris of the most dangerous sort to imagine that our art – or any human creation -- can substitute itself for nature.

To follow the evolutionary laws of success and failure, we must take an evidence-based approach, just as nature does. We must adopt what is most successful, from whatever source, and modify or eliminate that which is not successful. And we must look at the

full range of criteria for success, and not merely the degree to which a given structure appeals to us, or entertains us, or speaks to us as a moving piece of art.



Dolphins evolved the best solution to the complex problems of turbulence in their dorsal fins – and had no qualms about reviving a "pastiche" of the much older shark fin

So let us ask the question, what is the state of the built environment today? How has it been transformed under the 20th Century model of architecture and building, and how is that transformation occurring now – and in what direction for the future?

Is the evolution of the built environment moving in a direction that is more sustainable, more durable, more beautiful, and therefore more likely to allow human beings to survive and prosper – or is it less so?

The evidence here is overwhelming. For anyone who cares to look without ideological agendas, the quality of the built environment across the globe, from a human point of view, has decayed severely in the last century, and is continuing to decay. And it is using unsustainably high levels of energy and resources. It is not ecologically sustainable.

This is not only because we are using the wrong sources of energy. It is because our cities have become fragmented, disordered and highly inefficient. Our way of life itself has become fragmented, and overly dependent on high-energy systems like the car, and a high-resource lifestyle. Our sprawling "urban obesity" is causing severe damage to the biosphere on which life depends.


Athens before and after 1900

This ecological unsustainability translates into economic unsustainability, as the costs of maintaining this level of resource use mount. "Peak Oil," the phenomenon in which demand for oil grows faster than supply, is only one example of the likely soaring costs we will face in years ahead.

Moreover, there is a social dimension to this unsustainability too. There is a high price to be paid in the physical and mental health of people who are increasingly fragmented, lacking in social contact, lacking in exercise, put under stress by their environment. There are likely to be grave social and political consequences of further ecological damage, as populations lose access to adequate supplies of drinking water and arable land.

How do the structures that exist today compare to those of our heritage – say, a century or more ago? A full geometrical analysis is beyond the scope of this module (see for example the companion module, "Whatever happened to urbanism?") but we can summarize as follows. The buildings and neighborhoods of our heritage generally had the following desirable characteristics:

Neighborhood scale:

- ≅ Greater compactness, and integration of high-quality spaces;
- ≅ Greater connectivity between spaces – particularly public, semi-public, semi-private and private spaces;
- ≅ More fine-scaled distribution of daily needs and amenities (including employment);
- ≅ Strong, human-scaled public realm;
- ≅ Facilitation of walking and outdoor interaction;
- ≅ Many diverse choices between areas of public interaction and private tranquility.

Building scale:

- ≅ Efficient, low-carbon methods of effecting ventilation and daylight;
- ≅ Strong connection between the building and the public realm;
- ≅ Judicious placement of smaller window openings, for energy conservation and privacy;
- ≅ Easily adaptable forms for new uses;
- ≅ Easily repairable materials and systems, using local labor (and therefore providing more sustainable local employment);
- ≅ Durable aesthetic character that remains attractive over time, and is less sensitive to the whims of design fashions (which can result in a building becoming disused and even demolished).

Clearly there is much that we can still learn from these buildings.

Conserving the "hardware" of heritage, and also the "software"

Few people disagree that we should conserve the most important examples of our built heritage, and many scholars and officials devote their careers to doing so. But what of the lesser examples – the more ordinary buildings that generally far outnumber the ones considered "important?" Most people agree that we should try to conserve as many of these buildings as possible, because they are often considered attractive and potentially successful places for our activities today. There is also a growing awareness of the ecological value of doing so, since such buildings conserve resources and "embodied energy."

More controversial is the notion that we need to conserve the "software" – the knowledge and the patterns that these buildings embody. As discussed above, there is a common feeling that the re-use of such patterns is somehow "inauthentic" in the modern world. But as we have seen from the strong analogies with biological evolution, this may be a

misunderstanding of the importance of such patterns, based upon an over-emphasis of the purely novel expressive intentions of art.

From the perspective of greater sustainability, there is an excellent argument for re-using these patterns. It is that many of the problems that are solved by such buildings are recurrent ones, which we still face today. We must again find lower-carbon ways of maintaining thermal comfort. We must find ways that more compact, higher-density environments can be more successful and more "livable" for people – to conserve the ecologies of the countryside, and to make our own patterns of consumption more efficient and more benign. And as always, we must still provide good connections and contact between people, indoors and outdoors – something we have begun to do poorly in recent decades.

Moreover, we must still find reliable forms of daily beauty that reward us and provide the properties that we find biologically satisfying. These are not only expressive artistic qualities, but also qualities of the human environment that research has shown to be beneficial to the health and well-being of people.

The field of "biophilia" is a burgeoning one, closely related to the field of "evidence-based design." Both are concerned with an empirical process for determining the factors in the built environment that are beneficial to the well-being of people. It turns out that many factors play a role. For example, in a famous study by Roger Ulrich, patients on a hospital ward with a view from a window onto vegetation and trees had a measurably higher recovery rate than did those who had a view to a contemporary building wall. Many other such factors have been shown to be beneficial – obvious ones like sunlight, fresh air and water, but also less obvious ones, like scaling patterns, or earth tones, or a sense of refuge combined with a sense of prospect.

Moreover, historic buildings seem to perform remarkably well in evaluations of biophilic properties. This may well be because they were evolved over a longer period of time to contain more of these traits – particularly those pleasing geometries, like scaling patterns, or biomorphic shapes that resemble trees and leaves.

In any process of evidence-based design, there is always one central challenge. It is that environments are complex. They are web-like structures of adaptations, and not simple mechanical assemblages of design factors. Therefore it is extremely difficult to assemble a successful combination of elements quickly, without recourse to the fruits of an evolutionary process. This is one central weakness with an experimentalist, "tabula rasa" approach to architecture.

But this is also precisely the advantage of the "software" of historic structures: it often contains just such still-useful information. It may not be sufficiently adapted to a particular time and place – but it may also be far ahead of any other option. And it may be possible to complete such an adaptation relatively easily, by applying local materials and methods. Indeed, history seems to be full of such examples of transplantation and re-adaptation.

In this sense, then, local identity is not a rigid thing. It, too, is constantly evolving – but not by wholesale erasure of what came before, but by transformation, re-application and re-adaptation of it. It is, in a sense, a living character, expressing the qualities of a place as they endure and transform.

Epilogue: Re-thinking the Venice Charter

The policy in much of the world regarding regeneration of historic monuments and sites is governed by the International Council on Monuments and Sites (ICOMOS), a UN-sponsored NGO created in 1964 by the Second Congress of Architects and Specialists of Historic Buildings. Simultaneously, the Congress adopted the Venice Charter, a document with 16 articles covering essential principles of conservation, restoration and related practices.

Because so many cities contain heritage buildings and neighborhoods, the Venice Charter has come to be highly influential beyond the realm of heritage buildings, in shaping the thinking about the kinds of structures that are appropriate in a modern context more generally.

In particular, one article has come to be seen as highly significant, in heritage conservation and beyond:

> *ARTICLE 9.* The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins, and in this case moreover any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp…

The intent was to stop the "falsification" of history, which could be caused by new structures that could be confused with those of an earlier time. Such a confusion could be damaging to the memory of what was authentic in our heritage. Thus the phrase "must bear a contemporary stamp" has been interpreted to mean "must be distinct from the identifying characteristics of earlier periods, such as styles, materials, colors etc."

This concept has been extended to suggest that *any* new work, in virtually any context, must eschew repetition of stylistic characteristics that might confuse it with the work of the past.

But as we have seen, such a view of history and style is much too pat. History is not a neatly "segmented worm" in which one era has only one distinctive architecture, another era has another. Rather, it is a complex weave, with recurrences, transformations, echoes, and all manner of other fuzzy borders. (The good architects of England did not wake up in 1837 and pronounce, "Victoria is Queen, so from now on we must practice a wholly new style of architecture, and continue to do so until her death!" Rather, the label; "Victorian" was ex post facto, by later historians.)

It is not the job of the built environment to be "readable" to those who have an interest in understanding the chronologies of history. Rather, that is the job of conservators, who must develop interpretive materials that help citizens to understand what it is that hey are seeing. Is this monument representing the state of the house in 1740, or 1750, or 1760? Should that wing be demolished because it was not original, but was added in 1830 – or is it indeed its own piece of relevant history, to be kept and described as such?

Certainly we should not say that the University of Virginia rotunda (built in 1826) looks far too much like the Pantheon, and might be confused with its time, and therefore we must demolish it!

Likewise we must not say that a building built today that has similarities with another historic building, must not be built on that account alone. Again, there is a powerful evolutionary argument for permitting and indeed reviving such buildings: the recurrence of suitable solutions in nature, which must be allowed to proceed,. The porpoise must not be banned from having a dorsal fin that looks too much like a shark's – lest ichthyologists become confused.

As the INTBAU Venice Declaration notes (see Appendix II) built environments are more than museum cases – they are organic structures that continue to evolve and transform dynamically. We must recognize the ongoing role of historic buildings to continue to serve our needs -- which might require their adaptive re-use in ways that a historic purist might find disquieting. But the alternative might be that they fall into utter disuse and destruction. At the same time, we must recognize the role of historic patterns to continue to meet our needs, of solving the many timeless problems of living well together.

As we think about our daunting challenges of sustainability, let us remember only one of many renaissances that have occurred throughout human history – the one that we recognize by that name, that began in Italy in about 1400. Filippo Brunelleschi, Cosimo de Medici and a few others had an audacious idea: that they could re-make a great civilization, based upon the ancient patterns and the natural principles and materials of their own land. Six hundred years later, many of their achievements remain the most loved and enduring achievements of human civilization. We can now be grateful that they did not say to themselves, "this architecture is now over a thousand years old, and it is no longer of our time. We must build a wholly new architecture instead."

There were indeed many innovations, and many breathtaking new expressions. But there was, at its core, the recognition that in nature and in history – in one's own nature and history – lie all the treasures we need. The latest lessons of our sciences today – evolutionary biology, complexity, cognition, and much else -- only reaffirm that ancient lesson.

ADDITIONAL READING

Semes, Steven. *The Future of the Past: A Conservation Ethic for Architecture, Urbanism, and Historic Preservation.* WW Norton, New York. 2009

Adam, Robert. "Creating local identity through architecture." World Architecture News. Accessed at http://www.worldarchitecturenews.com/index.php?fuseaction=wanappln.commentview&comment_id=128

Jacobs, Jane. *The Death and Life of Great American Cities.* Random House, New York. 1961.

Christopher Alexander. *The Nature of Order.* Center for Environmental Structure, Berkeley. 2003.

Appendix I: The Venice Charter

INTERNATIONAL CHARTER FOR THE CONSERVATION AND RESTORATION OF MONUMENTS AND SITES

Imbued with a message from the past, the historic monuments of generations of people remain to the present day as living witnesses of their age-old traditions. People are becoming more and more conscious of the unity of human values and regard ancient monuments as a common heritage. The common responsibility to safeguard them for future generations is recognized. It is our duty to hand them on in the full richness of their authenticity.

It is essential that the principles guiding the preservation and restoration of ancient buildings should be agreed and be laid down on an international basis, with each country being responsible for applying the plan within the framework of its own culture and traditions.

By defining these basic principles for the first time, the Athens Charter of 1931 contributed towards the development of an extensive international movement which has assumed concrete form in national documents, in the work of ICOM and UNESCO and in the establishment by the latter of the International Centre for the Study of the Preservation and the Restoration of Cultural Property. Increasing awareness and critical study have been brought to bear on problems which have continually become more complex and varied; now the time has come to examine the Charter afresh in order to make a thorough study of the principles involved and to enlarge its scope in a new document.

Accordingly, the IInd International Congress of Architects and Technicians of Historic Monuments, which met in Venice from May 25th to 31st 1964, approved the following text:

DEFINITIONS

ARTICLE 1. The concept of an historic monument embraces not only the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or an historic event. This applies not only to great works of art but also to more modest works of the past which have acquired cultural significance with the passing of time.

ARTICLE 2. The conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the study and safeguarding of the architectural heritage.

AIM

ARTICLE 3. The intention in conserving and restoring monuments is to safeguard them no less as works of art than as historical evidence.

CONSERVATION

ARTICLE 4. It is essential to the conservation of monuments that they be maintained on a permanent basis.

ARTICLE 5. The conservation of monuments is always facilitated by making use of them for some socially useful purpose. Such use is therefore desirable but it must not change the lay-out or decoration of the building. It is within these limits only that modifications demanded by a change of function should be envisaged and may be permitted.

ARTICLE 6. The conservation of a monument implies preserving a setting which is not out of scale. Wherever the traditional setting exists, it must be kept. No new construction, demolition or modification which would alter the relations of mass and color must be allowed.

ARTICLE 7. A monument is inseparable from the history to which it bears witness and from the setting in which it occurs. The moving of all or part of a monument cannot be allowed except where the safeguarding of that monument demands it or where it is justified by national or international interest of paramount importance.

ARTICLE 8. Items of sculpture, painting or decoration which form an integral part of a monument may only be removed from it if this is the sole means of ensuring their preservation.

RESTORATION

ARTICLE 9. The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins, and in this case moreover any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp. The restoration in any case must be preceded and followed by an archaeological and historical study of the monument.

ARTICLE 10. Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modem technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience.

ARTICLE 11. The valid contributions of all periods to the building of a monument must be respected, since unity of style is not the aim of a restoration. When a building includes

the superimposed work of different periods, the revealing of the underlying state can only be justified in exceptional circumstances and when what is removed is of little interest and the material which is brought to light is of great historical, archaeological or aesthetic value, and its state of preservation good enough to justify the action. Evaluation of the importance of the elements involved and the decision as to what may be destroyed cannot rest solely on the individual in charge of the work.

ARTICLE 12. Replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historic evidence.

ARTICLE 13. Additions cannot be allowed except in so far as they do not detract from the interesting parts of the building, its traditional setting, the balance of its composition and its relation with its surroundings.

HISTORIC SITES

ARTICLE 14. The sites of monuments must be the object of special care in order to safeguard their integrity and ensure that they are cleared and presented in a seemly manner. The work of conservation and restoration carried out in such places should be inspired by the principles set forth in the foregoing articles.

EXCAVATIONS

ARTICLE 15. Excavations should be carried out in accordance with scientific standards and the recommendation defining international principles to be applied in the case of archaeological excavation adopted by UNESCO in 1956.

Ruins must be maintained and measures necessary for the permanent conservation and protection of architectural features and of objects discovered must be taken. Furthermore, every means must be taken to facilitate the understanding of the monument and to reveal it without ever distorting its meaning.

All reconstruction work should however be ruled out "a priori." Only anastylosis, that is to say, the reassembling of existing but dismembered parts can be permitted. The material used for integration should always be recognizable and its use should be the least that will ensure the conservation of a monument and the reinstatement of its form.

PUBLICATION

ARTICLE 16. In all works of preservation, restoration or excavation, there should always be precise documentation in the form of analytical and critical reports, illustrated with drawings and photographs. Every stage of the work of clearing, consolidation, rearrangement and integration, as well as technical and formal features identified during the course of the work, should be included. This record should be placed in the archives of a public institution and made available to research workers. It is recommended that the report should be published.

The following persons took part in the work of the Committee for drafting the International Charter for the Conservation and Restoration of Monuments:

Piero Gazzola (Italy), Chairman
Raymond Lemaire (Belgium), Reporter
Jose Bassegoda-Nonell (Spain)
Luis Benavente (Portugal)
Djurdje Boskovic (Yugoslavia)
Hiroshi Daifuku (UNESCO)
P.L de Vrieze (Netherlands)
Harald Langberg (Demmark)
Mario Matteucci (Italy)
Jean Merlet (France)
Carlos Flores Marini (Mexico)
Roberto Pane (Italy)
S.C.J. Pavel (Czechoslovakia)
Paul Philippot (ICCROM)
Victor Pimentel (Peru)
Harold Plenderleith (ICCROM)
Deoclecio Redig de Campos (Vatican)
Jean Sonnier (France)
Francois Sorlin (France)
Eustathios Stikas (Greece)
Mrs. Gertrud Tripp (Austria)
Jan Zachwatovicz (Poland)
Mustafa S. Zbiss (Tunisia)

APPENDIX II: The INTBAU VENICE DECLARATION

The INTBAU Venice Declaration
on the conservation of monuments and sites in the 21st century

The Athens Charter of 1931 made an important contribution toward the development of an extensive international movement for the safeguarding of our common heritage for future generations. The Venice Charter of 1964, noting problems which have continually become more complex and varied, re-examined the Athens Charter, made a thorough study of the principles involved, and enlarged its scope in a new document.

Almost half a century later, we have witnessed new problems and new complexities. Foremost among them is the challenge to maintain coherent and sustainable urban environments, within which historic monuments are often seamless elements, and living repositories of important and useful knowledge. It has also been noted that the Venice Charter did not sufficiently address challenges beyond Europe and the United States, and overlooked the vital role that traditional building crafts continue to play. Lastly, a number of logical contradictions have become evident within the Charter itself, or within its over-rigid interpretation.

Accordingly, a group of international leaders in conservation, architecture, urbanism and environmental planning, met in Venice in November, 2006, and agreed that the time has come to clarify the Venice Charter and its interpretation, addressing in particular the following issues:

- The PREAMBLE notes our common responsibility to safeguard ancient monuments for future generations and to "hand them on in the full richness of their authenticity". It is now understood, however, that any act of conservation or restoration is inevitably an act of alteration based upon historically partial knowledge. Hence the goal of authenticity must not be interpreted to require an absolute state of preservation of pre-categorized moments in time. Rather it must reflect the complex pattern of change and recurrence across the ages, including the present. It is to be established as much in interpretive materials as it is in the techniques of accurate conservation.

- ARTICLE 1 wisely includes urban and rural settings in the definition of an historic monument. We note that this may also include an historically unique settlement pattern or organisational structure within the landscape, which may embody important knowledge for future settlements.

- ARTICLE 2 calls for recourse to all the sciences and techniques which can contribute to the study and safeguarding of the architectural heritage. We emphasize the importance of scientific investigation, particularly for useful but overlooked knowledge embodied in historic monuments, which may prove to be relevant in unforeseeable ways to our challenges today and in the future. The participation of the public in scientific, educational and political exchanges on these topics is vital.

- ARTICLE 4 calls for the permanent maintenance of monuments. We note that maintenance using new elements in a compatible character is not "false historicism" provided the new elements can be readily distinguished by experts, or with the aid of interpretive materials.

- ARTICLE 5 prohibits changes to the lay-out of a building, even when making use of it for some socially useful purpose. But such changes must be allowed where the alternative is a threat to the building's survival, where the changes are not inharmonious as called for in Article 6, and where careful documentation of the changes is maintained. As much as possible, such changes should also incorporate the building's original spatial quality and structure.

- ARTICLE 9 calls for new work which "must be distinct from the original composition and must bear a contemporary stamp". But this goal must be dynamically balanced with other needs, including the need for coherent and enduring human environments. Thus, new work may be distinct from the original composition while still harmonizing with that composition. A contemporary stamp may be provided in a number of ways, including interpretive information or identifying marks or characteristics. It is not necessary to create a striking juxtaposition, which may violate the mandate to preserve the traditional setting or the relations of mass and color (Article 6, Article 13).

- ARTICLE 11 states that "the valid contributions of all periods to the building of a monument must be respected, since unity of style is not the aim of a restoration". But styles cannot be strictly assigned to a unique origin in a specific time or context, as they may be found to recur in repeated revivals within different periods and contexts. Therefore a variation of styles can be tolerated and accepted for any period, including the present. At the same time, a unity of composition can be maintained, and does not require a unity of style.

- ARTICLE 12 states that "replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historic evidence". However, this need not be interpreted to forbid replacements in a compatible style. It requires only an honest distinction of the new work, which may be made identifiable with the aid of interpretive information.

- ARTICLE 13 prohibits additions that detract from the interesting parts of a building, its traditional setting, the balance of its composition and its relation with its surroundings. Together with other articles, this must be interpreted to mean that contemporary additions that politely take their place within the harmonious composition (including revival styles, if deemed appropriate, as well as innovative new styles) are allowable. Additions that are deliberately discontinuous, discordant, or self-consciously dominant, must not be allowed to damage the balance of the composition or the relation with its surroundings.

Signed this 8th day of January 2007 by the authors:
In alphabetical order

Robert Adam - UK
Claudio d'Amato - Italy
Ethan Anthony - USA
Irena Bakule - Latvia
John Bliss - USA
Ben Bolgar - UK
Youcef Chennaoui - Algeria
Vikas Dilawari - India
Matthew Hardy - Australia/UK
Meisha Hunter - USA
Ian Lochhead - New Zealand
Paolo Marconi - Italy
Michael Mehaffy - USA
A. G. K. Menon - India
W. Brown Morton III - USA
Nicholas Patricios - Greece
Navin Piplani - India
Savita Raje - India
Bob Rose - Australia
Steven Semes - USA
Krupali Uplekar - India/USA
Pance Velkov - Macedonia