

SOME METAPHYSICAL CONSIDERATIONS RAISED BY THE COMPUTER-GENERATED ELECTRONIC ENVIRONMENT

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ABSTRACT

The effects of the computer on the designer are profound, and affect design methodology and habitation. The computer-aided designer experiences within the electronic environment a freedom from certain important constraints of real-world modelling of physical reality. Electronic configurations are not bound by the constructional, material, or structural constraints operating in the physical world. This freedom is liberating, in that the imagination is given a powerful tool with which to develop external representations of ideal environments. But there is also the potential of destructive tendencies. Is the increasing sophistication of external tools of the imagination at the expense of the ability of the individual to master the internal imagination - are we externalizing at the price of inner vision? There is also the possibility of greater alienation from the physical world. We lose the tactile sensitivity, and the spatial and structural intuition with which we draw and make physical models. These are essential parts of the design of the physical environment.

We are left on the horns of a dilemma. The rapid response and exciting images of the computer-generated video environment suggest we are entering an era when architecture itself becomes electronic. The physical built-form recedes in importance, and may even become redundant. But we must also ask: Are we entering a post-computer age? Will we realize the potential profundity of our innate human biocomputers - to the point where we renounce the hard technology of the material for the soft technology of consciousness?

INTRODUCTION

This paper looks at the relationship between the electronic environment and the workings of consciousness, and the consequent implications for architectural design and habitation. Particular natures and structures of consciousness are characteristic of the inhabitants of specific cultures at particular times and places. These forms of consciousness arise, are sustained, and are transformed in dialectic with the characteristic spatial form and structure of the physical environment with which they are associated. Significant modifications of the workings of consciousness will be reflected in their effect on the physical environment and on associated behavioral and habitation patterns. Conversely, significant alterations of the physical environment are likely to engender modifications of consciousness. Consciousness interacts with the physical environment, both in making it more habitable, and in inhabiting it. But the tools with which this interaction takes place are not neutral, but influence both physical environment and consciousness. Further, these tools are indicative of the nature of the consciousness that produces them.

The electronic environment of computer-aided design is such a tool. It is not neutral, but influences the nature of the physical environment for which it is used to design. It affects the design process, and modifies our consciousness. And it is helpful in showing us what we are and are not.

THE CULTURAL SHIFT IN CONSCIOUSNESS OF THE MODERN WORLD

The modes of consciousness we employ - whether internal or external - have profound effects on the architectural environment we engender and inhabit. I will argue that the primary strands that characterize the cultural shift in consciousness of our age are three-fold. Since about the time of the Renaissance, there has been an increasing externalizing of the processes of consciousness. This is reflected in the emphasis given to technology through the Industrial Revolution, and the tendency to model living phenomena as mechanistic processes. Koyré characterizes the fundamental changes in world-views which have taken place as the destruction of the Cosmos (the conception of the world as a finite, closed, and hierarchically ordered whole), and the geometrization (or more correctly decentralization) of space. But, I argue, the momentum of externalizing has become excessive. In response, a necessary complementary wave of internalizing is now underway.

THE ELECTRONIC ENVIRONMENT AS PRODUCT OF THE EXTERNALIZING MOMENT

The electronic environment is significant as product and evidence of the externalizing principle. It is as if the workings of the mind are being made tangible, and are thus becoming more accessible. Associated with this externalizing is the danger of trivialism. We develop powerful tools that are capable of the production of great quantity - but at the very real expense of a concomitant inability to produce or to appreciate quality. But a paradox arises, as the externalizing of the virtual workings of the mind threatens the modern Western taboo against introspection. The more sophisticated our command of what we control "out there", the more we expose our inner selves to the relentless challenge of self-understanding. It is my belief that in doing so we become more painfully aware of the superficiality of the modern age - and of the comparative sophistication and wisdom of the past. This opinion is shared by a number of Traditional scholars, and presented in the profound writings of René Guénon, Frithof Schuon, and Ananda K. Coomaraswamy among others.

In many ways, the electronic environment has evolved as an improved substitute for the psychic environment. By the psychic environment I simply mean the environment of the psyche - the mental and emotional world of the imagination. In a sense, we replicate certain mental operations in the electronic environment. In so doing, we obtain a degree of detachment from them. This allows us to rationalize and automate them, and improve their efficiency. In effect these operations have become reified. But in turn, the detachment this affords enables us to recognize similar processes to those reified electronic operations taking place within our mental worlds. This allows us to modify our patterns of thinking and workings of consciousness. So the irony of the development from psychic to electronic environment is that it could well prove to be a key means of rediscovery of the great worth of the psychic environment!

THE EXTERNALIZATION OF CONSCIOUSNESS OF MODERN SOCIETY

We live in an age which has felt the full force of a wave of externalization. Socially, credence is given to external indicators of wealth, status, and power. Appearances matter. We espouse a materialistic culture that places a high value on physical and social reality. This is reflected in the importance given to technology on the one hand and to politics on the other. At the same time, a low value is placed on what we might term psychic, internal, or metaphysical values. Religious thought comes under out-moded Marxist criticism, but the popularization of religion often leads to banality. The contemplative life is widely devalued. Post-modernism finds it convenient to relativize aesthetic response. One might even term this the age of the "Loss of the Ideal". So we see associated with this wave of externalization the somewhat insidious discrediting of inner value, significance and meaning. Concomitant with this we see the arising of a desperate need for social conformity, and the ruthless production, manipulation and consumption of social meaning.

We are outward directed, and concerned merely with the play of appearances - beyond which we assert lies nothing. We actively suppress intimations we might have of any such depth, for they threaten our tenuous hold on reality, on what we perceive as our power of control over the external world. It is convenient for the purposes of this paper to define needs as a mis-match between inner and outer realities. Typically then, our instinctive response to perceived need is to seek to rearrange our outer world to suit ourselves. The evolution of the electronic environment can be understood in this light, as furnishing us with more powerful tools for change. The rearrangement of the outer world we seek is usually to be achieved by accumulating more - whether this be wealth, material possessions, power, or position in society. Needless to say, this process of external rearrangement and accumulation requires the expenditure of physical energy and socio-political power in order to achieve its goal. An economy of scarcity restricts the deployment of resources, and preserves structures of privilege. We call politics "the art of the possible", as if mere possibility were sufficient legitimation in itself. And we earnestly profess that "Power is All".

THE ECOLOGY OF CONSCIOUSNESS OF TRADITIONAL SOCIETIES

These patterns stand in contrast to those typical of traditional societies - i.e. societies characterized by stable (but by no means inert) institutions. Stable patterns of that kind arise somewhat like standing waves, which maintain their structure in the midst of constant flux - i.e. "states exist, and people pass through them". Such patterns exist to satisfy both temporal and spiritual needs in an integral manner. Snodgrass provides a clear analysis of the role of traditional Hindu and Buddhist architecture in this light; and Steil reminds us that tradition has a dimension of timelessness and universality, being the selected wisdom of people throughout the ages, and a character of local and geographical specificity. In a traditional society therefore, one tends to respond to perceived need, not by seeking to change the outer world, but by rearranging one's inner world. This might be achieved by redefining the relation between inward and outward realities. It is done in ways which respect and make good use of external constraints, whilst satisfying deep inner needs, such as the need for significance and meaning. This inner transformation requires, in contrast to the modern situation, psychical energy, and a measure of wisdom in order to be accomplished.

ENCOUNTERS WITH KARMA

As an example of this difference between external and internal rearrangement, I cite my experience in living and travelling with a Tibetan refugee in a remote area of the Indian Himalaya. Living in close company with Karma, I became all too aware of the differences in our attitudes. My attitude was: "dissatisfied with what I have, how can I get more and better?" By contrast, I found my friend's attitude to be: "content with what I have, how do I use it to best advantage?" In the circumstances in which we both found ourselves, my attitude was externally dynamic but inherently unstable - an external growth orientation which was dependent upon consuming scarce resources. His attitude was by contrast internal; accepting graciously the external constraints upon his spending, he used his inner resourcefulness to best advantage. This difference was reflected in the architecture of our dwellings. The detached suburban house I had left was as an island in a sea - a spatial form which reinforced externality. Although there was some inwardness, an accumulation of different rooms provided for different purposes. I was expected by society to be upwardly mobile - to actively improve my dwelling, sell it to make a profit, and purchase a larger more prestigious dwelling. But Karma lived - both by necessity and choice - in a steady-state situation. He shared an eight foot square room with his wife, two young children, and a dog (together with myself and other visitors on occasion). There was no Western style furniture: the family lived, cooked, ate, played, and slept in that one room. But I found the quality of experience of dwelling there more satisfying than my own relatively privileged situation. There was an atmosphere of serenity and genuine warmth in Karma's home that I seldom experience in the West. Again, when I travel, I am heavily reliant on external sources - for example, I usually eat in

restaurants. By contrast, when I travelled with Karma, he would produce a delicious breakfast in our small hotel room, making bread on my tiny Optimus stove. I was almost always "on the road", and never had enough; Karma was nearly always "at home", whatever the outer circumstances.

The difference is important. In one situation, an unstable rapidly changing society increasingly pressurizes individuals to conform to its imperatives. We are expected to worship the economy and society, and our personal lives are more than ever the subject of social scrutiny. We are informed that all aspects of our being are political. Our worth is measured socially in the degree of influence we bring to bear. We are pressured to spend our entire lives fighting for and maintaining our position. Unbelievably, this is seen as progress! But Karma was the product of another situation. He came from a culture where (prior to the Chinese invasion of Tibet some thirty years ago and the subsequent desecration in the name of progress) the individual graciously accepts his lot in a stable, ordered and enduring society. He knows his current lot to be the result of *karma*, that is, the effects of his previous actions - for which he alone is ultimately responsible. Within that given set of constraints, (which within such a society are not inert but have a natural life-cycle), the traditional individual makes the best of his or her circumstances. In doing so, he earns and is granted a measure of independence and centeredness that is denied the modern individual. Instead of acting outwardly, he realizes inwardly. This is not a retreat from the world, as our superficial age would attempt to interpret it for us. It is rather the perennial recognition that the deepest dimensions of being are accessed internally, for we bear them within each one of us.

TIBETAN *THANKA* PAINTINGS AND COMPUTER-AIDED DESIGN

Karma had been a *thanka* painter. *Thankas* are religious banners in Tibetan Buddhism, and are highly cultured artefacts. It is pertinent to compare this art with computer-aided design, with which I have had experience. As a sophisticated geometer, I have long been fascinated with that area of overlap of art and mathematics, form and science, that characterizes architectural design. I initially revelled in the power that CAD systems provided. I could now readily produce representations of spatial insights that had previously been laborious to explore! Excitement alternated with frustration at the stupidity of some aspects of programs. One encountered the inability or difficulty to produce electronically what were really quite simple and archetypal operations to conceive, visualize, and sketch free-hand. But then there would be the novelty of yet another new program, with previously undreamed-of possibilities... - to do what?

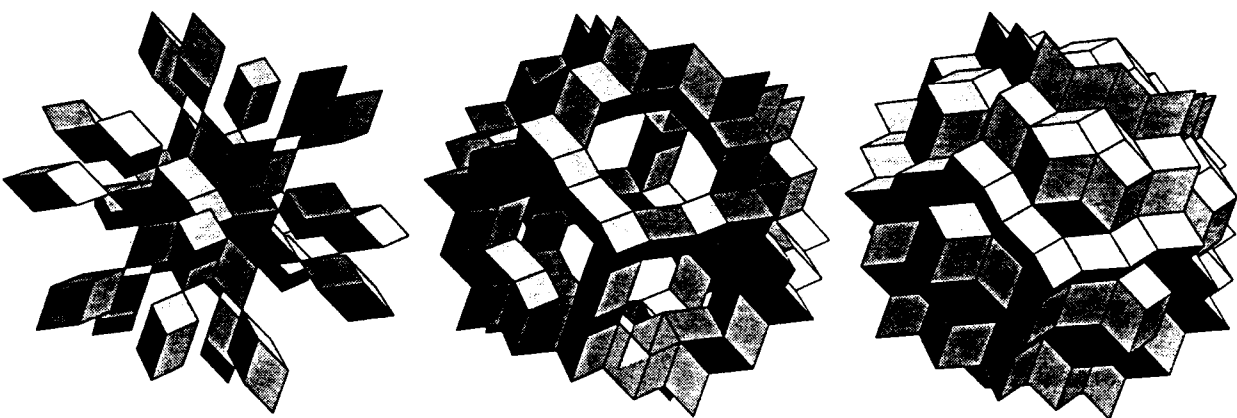


Figure 1: Staged Zonahedral Mandala expansion, of Golden Section Parallelepipeds and Rhombic Triacontahedra. The complete expansion provides a geometry for a pneumatically-stressed centralized tensile lattice, and is suggested as an appropriate structure for large-scale human settlements in micro-gravitational Outer Space (Meurant, 1988).

Over a period of time I began to question just what it was that I was doing in and with this electronic environment. On the one hand I was repeatedly told I was ahead of the game. It was an exciting and powerful new field that was opening up - this was, after all, the future! But any sense of achievement gained did not compare with the deep satisfaction I knew in working with Sacred Geometry, using just compass and straight-edge. Nor did it compare with researching into Solid Geometry, exploring the harmonies of the regular and semi-regular polyhedra, and their relation to Architectural Space and Proportion. Working with computers was just a damn sight less satisfying. My ability to visualize rich spatial structures in the mind's eye has developed over many years of imagining, sketching and modelling. But the effect of the computer was not to strengthen this ability, but to weaken it. It made me less self-reliant and more dependent upon external tools. Where once I used my intuition, now I had to analyze. I could do more - but it meant less.

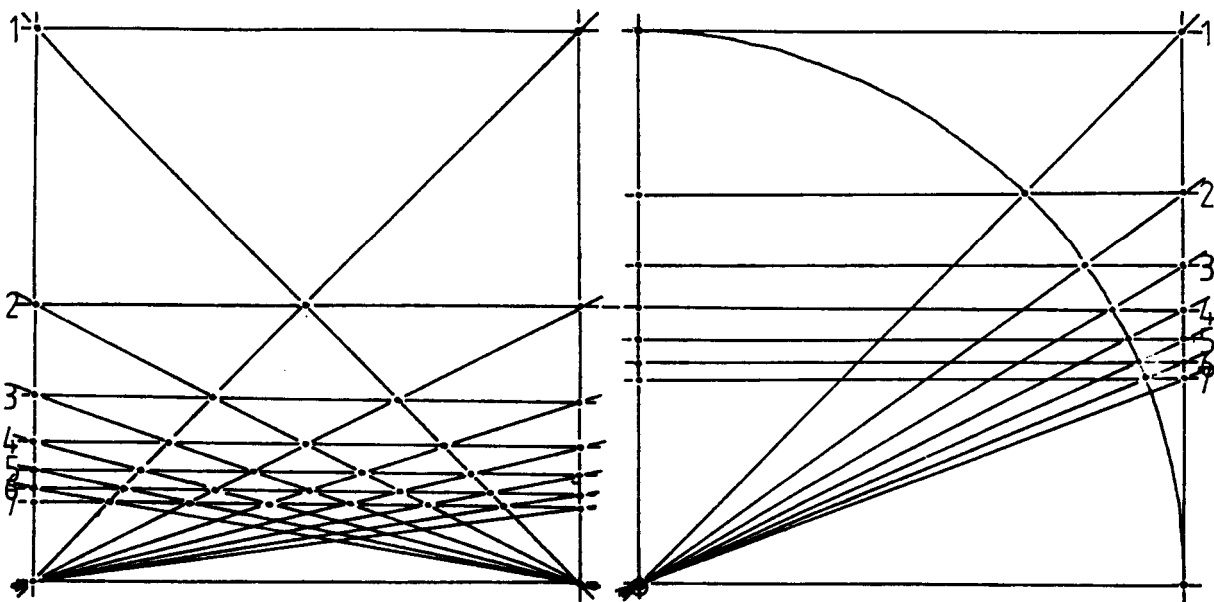
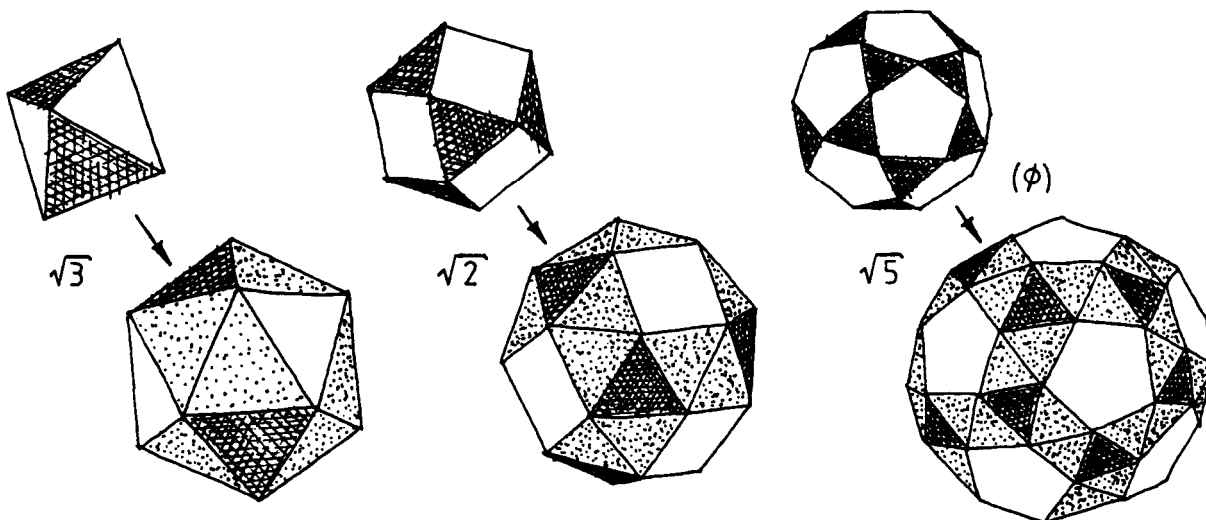


Figure 2: Sacred Geometrical Constructions ~ left, the Natural Length Protractor from the author's PhD; and right, the Inverse Root Harmonies, as taught in the KAIROS School of Sacred Architecture under Keith Critchlow FRCA.



Snub Tetra-Tetrahedron (Icosahedron)

Snub Cube-Octahedron

Snub Dodeca-Icosahedron

Figure 3: All 18 regular polyhedra exhibit Tetra-Tetrahedral (TT), Cube-Octahedral (CO) or Dodeca-Icosahedral (DI) symmetry. Six belong to two symmetry classes, which makes twenty-four in all. The CO Octahedron is also the TT Tetra-Tetrahedron; the D-I Icosahedron is also the TT Snub Tetra-Tetrahedron. From my "A New Order in Space".

The electronic environment was certainly useful for research in imaging complex spatial configurations, and in ways which were compatible with presentation and publication. (In this regard, the desk-top publishing capabilities initiated by the MacIntosh revolution may well prove one of the most significant transformations of the decade). But there was an ontological loss. With time, I became aware that it is more rewarding to ponder the depths of the human psyche, than to become engrossed in the essentially meaningless artificial soul of the machine. I had been highly productive - in external terms - but it actually meant very little. It was too easy! By contrast, I began to explore Tibetan patterns common on thankas, frescoes, and timber-work. These beautiful curves have evolved over many hundreds of years of devotional activity. I came to realize that the enlightening image is the product of the enlightened consciousness. This process required a stable and enduring Tradition, that is one that is imbued with the sense of the Sacred. When Karma painted his thankas in the monastery, (until the financial demands of his new family required him to leave), he was purifying his consciousness. In the dedicated traditional craftsman, this becomes an intentional process - it is an integral part of the traditional aesthetic and philosophy of art, as becomes clear in many of Coomaraswamy's fine writings. The sense of repose I experienced later in Karma's home and in his company was in part the consequence of his long apprenticeship. Whilst he was making things - beautiful objects - "out there", he was more importantly making a beautiful "in here", in his heart. I stress that this was the effects of his own industrious efforts in concert with a profound vital Tradition.

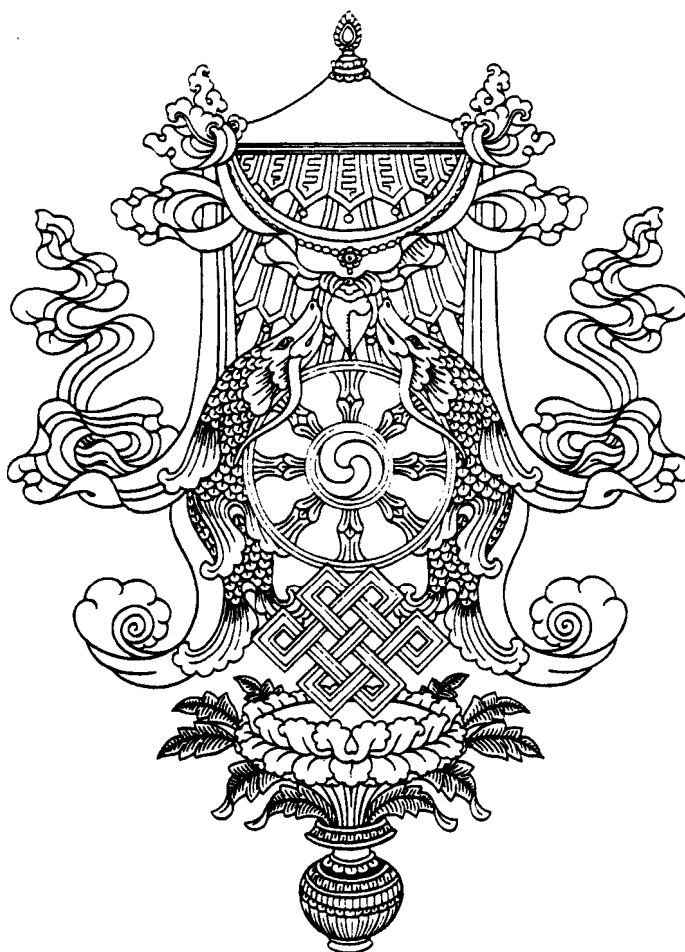


Figure 4: The Eight Auspicious Symbols of Tibetan Buddhism. Note especially the curves of the stylized silk banners. Diagrams of this sort combine a profound symbolism with a beauty and economy of line that facilitates meditative states, both in their creation, and in their contemplation. After Jam Yang, Tibetan Thangka Painter.

THE PROBLEM OF THE MODERN AGE

I think this is in essence the problem the modern age must face. It has become too easy to do - to travel, to act, to write, to play, to work, to produce. But the quality of what is done, of what is produced becomes less and less relevant. And the intent with which it is done has become of even less consequence! This is tragic. Ultimately what we are producing, when we work, is ourselves. We are refining our consciousness. Traditional wisdom teaches us that the intention with which we approach this work is critical to its effectiveness. But one questions whether we have ever been so less aware of ourselves. We earnestly seek to change the world in the name of progress - and the last place we look to achieve that is within. The potential distractions have become so great, that we are now told in all seriousness that there are only distractions, only appearances... But all this means is that we are merely losing sight of our profound nature, seduced by the infinite play of formal possibility. We become more desperately ensnared in the web of *Maya*.

So I am of the opinion that we face dangers in the explosion of the electronic environment. The electronic environment of computer-aided design has evolved as a powerful tool for designing the physical environment. But we are being seduced by the means of production, which are becoming ends in themselves. We see this in modern computer-generated video sequences where designers are clearly revelling in the novelty and rich potential the medium offers. In fact we are learning to inhabit that electronic environment as the primary external reality. The virtual world of the computer image, of television, film and video, is so much more exciting than the physical environment of dreary suburbia, roads and cars, buildings and objects. The electronic environment changes much more rapidly; its more colorful; there's more choice; its more responsive; its more accessible. But is it more satisfying to our deepest needs?

THE ELECTRONIC ENVIRONMENT AND THE ENVIRONMENT OF THE PSYCHE

The problem I really have with the electronic environment is its lack of subtlety in comparison with the psychic environment. The psyche constitutes an incredibly rich environment, that may be readily accessed through meditative visualization and traditional symbolism. It is inexhaustible. But the excesses of the great historical wave of externalization have meant that we have become alienated from our psychic world, and thus we have great difficulty in knowing ourselves. Our culture is losing the traditional techniques of inner vision.

Further, compare the comparative degree of integration to the physical architectural environment that purports to sustain them. On the one hand, considerable research resources are consumed to produce simple holographic images, which might substitute for or supplement the physical environment (providing the hardware and energy to run them is available). On the other hand, some familiarity with traditional Hindu and Buddhist culture convinces me that there exist in these traditions highly sophisticated techniques of the progressive visualization and manipulation of images in the contemplative act. Christian and Islamic traditions also have much to offer, and it is worth referring to Swami Saraswati's discussion of Meditation as a world-wide culture, and to Eric van Reijn's translation of the Epistles of the Sincere Brethren of tenth-century Basrah.

These psychic abilities (i.e. abilities of the psyche) of traditional religious cultures more than favorably compare with our electronic efforts. Further both the hardware necessary to perform them (let us say a clear and unsullied consciousness) and the software (the traditional meditative wisdom and practices) are readily accessible - provided we are disciplined and well-intentioned. And of course both are highly resource efficient! I might add that the "meditation technology" of these cultures is so sophisticated that individuals elect to live in retreat from the social world, not communicating with another living soul, for periods of one year; three years; twelve years; and even for a life-time, until death. Having met a few individuals who have undertaken such retreats of several years, I personally attest to their qualities as vital, enlightening beings.

SACRED ARCHITECTURE AND THE TANTRA OF CAD

One significant area of my interest is Sacred Architecture. Kramrisch draws attention to the remarkable integration of the physical and the metaphysical in Hindu and Buddhist sacred architecture. In both traditions, the Temple is not merely the physical fabric of the building, but more importantly the psychic and spiritual environment it engenders and sustains. Zimmer makes this clear in his seminal work "Artistic Form and Yoga in the Sacred Images of India", and shows how, in the Traditional understanding, the physical artefact exists primarily as a support for contemplation. The contemplative act generates and sustains a psychic environment that is in many ways comparable with the electronic environment, but one that is closer to our center of being. It is a psychic environment that we are entitled to call architecture, or perhaps an architectural environment; and it is one that mediates our deeper self. By contrast, the electronic environment all too often perpetuates the alienation of the viewer intrinsic in the subject/object dichotomy inherent in the modern Western *Weltanschauung*. The computer-generated environment has a fascination and self-rationalization that tends to isolate us from both inner and outer realities. But the atomistic, detached world-view characteristic of our age is becoming increasingly suspect as we find we can no longer separate the perceived from the act of perception, nor the conceived from the act of conception. Wilber, and Bohm, among others, have drawn attention to this issue.

I am of the opinion that the Tantric tradition of art and architecture in Hinduism and Buddhism has much to offer modern architectural theory and practice, and is particularly relevant to the use of the electronic environment in design. In the Tantric tradition, the externalizing act of making the art-object (artefact, building), of producing, is one part of an integral cycle of devotional activity. Khanna discusses how the art-object serves as a support for contemplation of supra-empirical principles, through the techniques of inward contemplation and the internal development of images in the mind's eye. The work of sacred architecture is intended to be viewed and experienced as a tool for internalizing activity. Its purpose is as a means of "unmaking" (or unmasking) the viewer, to where he or she attains a more complete realization of his or her deeper nature. Shankaranarayanan shows how, in relation to the *Sri Yantra*, "...the Mandala is a pictorial representation of the process of descent or devolution of the One Supreme Consciousness, step by step, layer by layer, into the creation of multitudinous forms. Equally it provides the scheme for the evolutionary return of the individual unit so formed into the plenitude of the Fundamental Consciousness at the head of all Manifestation."

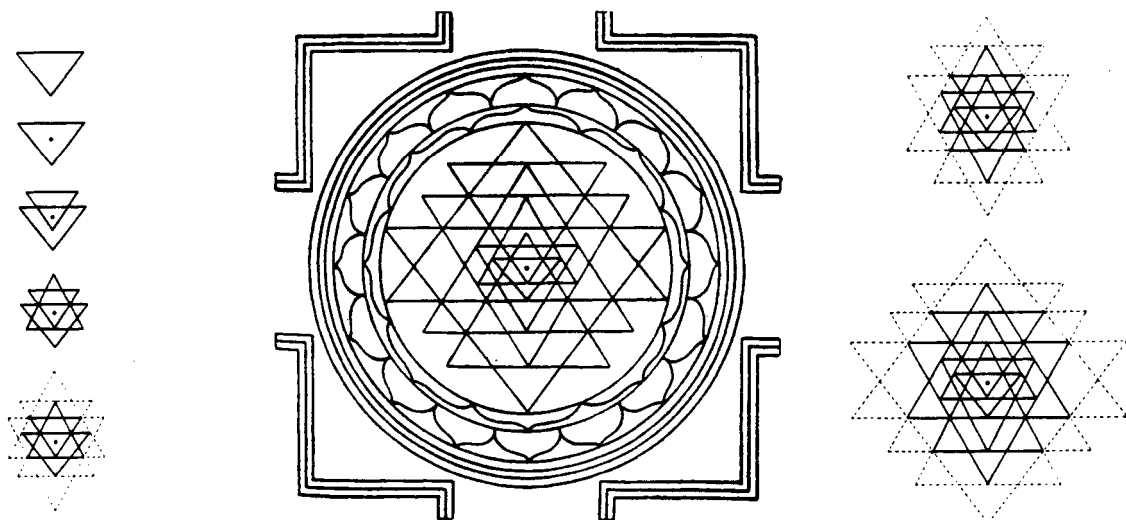


Figure 5: The Sri Chakra. Most important of the Hindu Yantras, its metaphysics are discussed by Khanna, Shakaranarayanan, and Zimmer, among others. Swami Premvarni Balyogi holds that it can only be properly drawn by individuals in a sufficiently developed state of realization (personal teaching).

This is a way in which I envisage the potential dangers of the electronic environment could be turned into virtues. By producing "out there", we are given a means of looking and knowing "in here", i.e. within. We learn to see ourselves. The electronic environment, and the architectural electronic environment it suggests, become ways of accessing more deeply our psychic environment. By doing so we have the potential to realize more clearly our true natures, to know ourselves. This is of no small value in an age which appears to be losing sight of itself; for in our preoccupation with the externalities of the moment we suppress, forget, and even wantonly destroy traditional means of self-awareness which have evolved over thousands of years.

The techniques of image creation and manipulation we use in the electronic environment, provide in turn tools for the imagination. In our mind's eye we are provided with a disciplined means of visualization. By so doing, we learn more control over the workings of our consciousness. By controlling the quality of consciousness, we influence the quality of the physical (and electronic) productions of that consciousness. By improving the quality of the physical (and electronic) environment, we provide a means of clarifying our own consciousness. This is a technique of internalization which allows for self-cultivation. It provides an ecological balance of externalizing and internalizing - a breathing out and in - that serves the needs of the soul as of the body.

THE METAPHYSICS OF THE ELECTRONIC ENVIRONMENT

It is in this sense that the Metaphysics of the Electronic Environment need to be addressed. In looking outwards, we see at the outermost limit matter. This physical world we experience has definite constraints, which favor an atomistic singular world-view. Physical objects occupy space; in general they cannot pass through one another; in a sense they "compete" for spatial location and extension. The danger is that we then project that exclusive building-block "world-order" into that of the social milieu, and into the inward space of consciousness. The territorial instinct is evidence of such an attitude, as is the excessive compartmentalization that characterizes our world-view, which Alexander has drawn attention to. But human society is not restricted to its physical manifestation; and the individual inner consciousness is not constrained by the laws of physical existence. Ideas and images are not material objects. The electronic environment provides an alternative mode of reality that in part simulates the world of consciousness. It is useful as a model for more appropriate world-views that accommodate the non-physical nature of consciousness.

In the electronic environment, within applications such as Mac3D, three-dimensional forms can be rapidly generated, scaled, rotated, translated and positioned. Unlike solid material objects, these forms can interpenetrate - they can be readily passed through one another, and occupy the same space. They do not need to conform to requirements for structural integrity, either as individual elements or as complex assemblages. They can be arbitrarily located in virtual space without needing to resist the forces of gravity, akin to operating in the micro-gravitational environment of outer space. Their configurations do not need to reflect constructional requirements, nor the properties of the materials from which they would be realized.

Although one generally works with component elements in the electronic environment, properties of this kind favor field perception over discrete object perception. (Interestingly, Wölfflin provides a comparative psychological study along these lines of German and Italian art and architecture of the Sixteenth Century). In such field or flow perception, component forms, although distinguishable, are seen as essentially non-distinct aspects of the same field. The interest shown recently in fractal geometry is indicative of this approach, and it is significant that one of my students who is highly creative in computer-aided design, Simon Ferneyhough, has seen fit to explore its architectural relevance. Elsewhere, Fuller draws attention to the relation of fractal geometry to Post-modernism. Another useful model is provided by vibrational theory, where component vibrations of a medium pass through one another without affecting each other, and are locally summed to provide an overall vibrational mode of excitation. Vibrational theory and

harmony have long been important facets of the theory and practice of sacred architecture. This is reflected in the importance Keith Critchlow gives in his KAIROS School of Sacred Architecture to the Quadrivium of Mediaeval Scholasticism. The Quadrivium consist of Number, Eurhythmy (Number in Time), Geometry (Number in Space), and Cosmology (Number in Time and Space). Sacred architecture, by incorporating all four, is intended to lead us toward Goodness, Beauty and Truth, which represent the higher Trivium of Grammar, Rhetoric, and Dialectic. A work by KAIROS teacher Robert Lawlor also relates Sacred Geometry, Proportion and Architecture.

In Mac3D and similar CAD programs, spatial elements are readily created that do not need to satisfy structural requirements characteristic of the physical realm. Elements are arbitrarily positioned in three-dimensional virtual space. No support is needed to hold them in place. Complex spatial assemblages are created in the virtual space of the electronic environment without regard for their inherent structural integrity or for their capacity to resist gravity. This is similar to Outer Space, where objects float freely and very large-scale structures are feasible. Elsewhere (Meurant, 1988), I develop an architecture appropriate to the micro-gravitational environment of Outer Space. This is based on traditional principles, and integrates structure, form and meaning.

Obvious dangers arise in the design process the electronic environment of computer-aided design permits, from the lack of feed-back from the physical world. Ideal solutions to real problems may not work in practice, and experience is of course necessary to exercise discernment in these matters. But then again, freedom from the immediate pressures of the everyday world may stimulate more creative and elegant solutions than a pragmatic approach can allow. The challenge is in obtaining a healthy balance of ideal and worldliness.

The electronic environment offers an enhanced facility for spatial manipulation and composition. It encourages compositional techniques that are unrelated to structural and constructional methods of realization. Thus a design may be evolved using an intersecting matrix of virtual cuboids, none of which are actually built. In the aesthetic appreciation of the work of architecture, this may not matter. The aesthetic sense responds to the underlying geometry, and so transcends the physical manifestation. Hersey discusses this process in the use of *linee occulte* in Renaissance architecture, and I develop the use of *linee occulte* for sacred architecture in my PhD thesis (Meurant, 1984).

The approach to design the electronic environment suggests does have its drawbacks - in potentially giving rise to an insensitive approach to structural, constructional and material considerations. But it need not. The master architect seeks to integrate all of the different facets of the architectural process. Elsewhere (Meurant, 1987), I suggest the work of architecture is not the physical artefact, but rather the architectural idea - which is expressed and in turn impressed through the physical object. As such, architecture is profoundly metaphysical. The electronic environment, used wisely, offers a means of enhancing that metaphysical understanding.

THE ELECTRONIC ENVIRONMENT MEDIATES IDEAS AND REALITIES

Thus the electronic environment suggests itself as a convenient mediation between the private world of metaphysical ideation, and the public world of physical realization (notwithstanding that universality remains a prerogative of the metaphysical!). On the one hand it simulates the physical environment, in recreating empirical space. On the other hand it simulates the psychic environment, in recreating imaginative space. In its mediating role, the electronic environment not only aids the physical realization of the metaphysical idea, as when a CAD package is used to develop a design which is then built. It also aids the internalizing moment, in reminding the architect that the inner space of the imagination need not be limited by the constraints of the physical world. In this regard, I find it significant that it is an architectural educator who is deeply involved in teaching and developing computer-aided design, Mike Linzey, who has developed a theory of public imagination and applied it to studio teaching.

Lilly has suggested that our minds operate to a degree as human biocomputers. At the same time I think we need to remind ourselves that our psyche is not merely an electronic environment, and should not be treated as if it is. Both the electronic and the psychic environment can be thought of as a medium within a vessel, within which virtual objects float for a time. We can presume in the case of the electronic environment that the particular nature of those objects does not influence the medium of the carrier environment. The same can not be said for the psychic environment. The ideas and images one entertains, whether voluntarily or not, affect the nature of the mind-stream. Traditional psychology is clear on this issue. Buddhist and Hindu Yogic psychology, for example, teaches that *citta vrttis* or fluctuations of the mind arise. Wrongful identification with these fluctuations results in the creation of *samskaric* impressions in the mental substance. These latent impressions mature over time, until karma is eventually exhausted. As they mature, they create further fluctuations and disturb the mind of the meditator. So that a mind which indulges in viewing pornographic images becomes tainted by the attachment it forms to those images. Conversely a mind which concentrates on more lofty images will with time become clear and unsullied. We become what we behold! Elsewhere, I discuss this process in regard to design and the architectural imagination (Meurant, 1987) and to Tibetan sacred architecture (Meurant, 1988). Thubten Legshay Gyatsho describes how the *Gompa* or temple functions as a support for enlightened mind in Tibetan Buddhism. By entering the Door of Religion (the monastic order), erecting temples, and performing the cycle of religious duties, the mental stream becomes endowed with merit. This generates higher cognition, which clarifies the mind-stream, and facilitates the path to liberation. The whole process is well-understood, having been taught and practised for many centuries by highly intelligent men and women. It is relevant to current architectural design.

However, there is also a deeper metaphysical sense in which traditional psychology holds that the contents of consciousness can not affect the essential nature of consciousness. This essential nature is rather like the *materia prima* - the universal substance that gives rise to all forms, but is constrained by none. (In the same sense, the sub-atomic particles of which physical reality is composed are presumably indifferent to their history - of whether they are or were parts of this man, that dog, this building...) It is therefore the task of architecture, whilst satisfying more earthly requirements, to reunite our limited mundane consciousness with that essential reality. The advent of computer-aided design assists that process in enhancing our understanding of ourselves.

CONCLUSION

I have addressed some metaphysical considerations raised by the electronic environment. There are potential drawbacks to the use of computer-aided design. Its use may be at the expense of the internal imagination, as we become more reliant on external tools of the mind. Further, we readily effect operations in the electronic environment that are impractical in the real world. This can give rise to alienation from the physical realm. However, this alienation may in itself be no bad thing, if it correlates with an increasing contemplative orientation. The obsession of recent times with the phenomenal realm may be giving way to an increasing metaphysical delight in the ideal, as the *vita activa* now yields its place to the *vita contemplativa*. Nevertheless, we need to keep in mind that the "inertia" of physical reality is not merely a nuisance to be overcome; it can also be a rewarding experience ~ as the work involved in building becomes an essential part of the joy of dwelling.

The potential of the electronic environment may well prove to lie in its timely reminder of the sophistication of our psychic environment. I envisage an architectural education which integrates in the studio context both computer-aided design and meditation - working with traditional techniques of mental concentration, meditative visualization, and the development of the architectural imagination. More generally, I look forward to a wave of internalization that renews respect for our inner world, and empowers through wisdom the profound capabilities of our innate biocomputers to explore and to more fully inhabit that rich environment of the psyche.

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