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**Restorative Urban Open Space: exploring the spatial configuration of human emotional fulfillment in urban open space.**

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## **Restorative Urban Open Space: exploring the spatial configuration of human emotional fulfillment in urban open space.**

### **ABSTRACT**

The capacity of outdoor settings to benefit human well-being is well established by research. Examples of restorative settings can be found throughout history and are still applied today in health care facilities, as healing or restorative gardens for the sick, but their wider significance in the urban public realm remains insufficiently explored. This paper presents a conceptual framework for restorative urban open space based on mosaics of linked and nested spaces woven into the urban fabric. The concept synthesizes the theory of centres, pioneered in the 1970's and refined in recent work by architectural theorist Christopher Alexander (2001), with material relating to social and ecological dimensions of outdoor spatial configuration (Hillier and Hanson, 1984; Forman, 1995; Porta and Renne, 2002). The concept argues for fundamental properties of order, as integrations of locational, directional and transitional spatial experience, which are present in the natural and cultural world and associated with human psychological benefit. This spatial arrangement may offer potential to resurrect people's connection with intuitively preferred forms and strengthen beneficial relations between human functioning and the spatial environment.

Key words: restorative, urban open space, spatial experience

### **INTRODUCTION**

...we hypothesise that for any landscape, or major portion of the landscape, there exists an optimal spatial arrangement of ecosystems and land uses to maximize ecological integrity. The same is true for achieving basic human needs and for creating a sustainable environment. If so, the major but tractable challenge is to discover the arrangement. (Forman, 1995, p.522)

In his book, *Land Mosaics*, landscape ecologist Richard Forman (1995) highlights that we now live in a world where more than 90% of the land surface has been altered in some way by human activity. Against this background he asks, if humanity is now mostly in charge of, and responsible for, most of the land surface, what designs of landscape are best for life (ibid, p.xiv)? Through comprehensive analysis of landscapes and regions he concludes that all land appears to us as mosaic patterns and that mosaic-like attributes are discernible at landscape, regional and continental scales. He argues not only that spatial arrangement matters to ecological integrity, but also identifies an optimal spatial arrangement consisting holistically of three fundamental structures called patches, corridors and matrices. Authority is claimed for this hypothesis because, as Forman demonstrates, this spatial structure is not merely an aesthetic device but appear to arise from the way land presents itself to us as a consequence of the forces, natural and cultural, that shape it. Forman's relevance to this paper lies primarily with his further claim that this spatial structure is not just important to biodiversity and environmental sustainability, but may equally be applied to achieving human needs. This raises interesting issues for contemporary landscape and urban design theory concerned with the development of understanding about the design of urban settings that can benefit human life quality. It challenges us to explore the possibility that spatial arrangement per se might influence human well-being, as well as the form and content of specific spaces making up the arrangement. It also signals particular features of ecologically beneficial spatial arrangement and raises questions about how to interpret this in the urban environment.

In response, this paper offers some reflections on spatial characteristics that may be relevant to social and restorative properties of urban open space. It suggests in particular that there is growing evidence of a convergence of thought in elements of urban design theory indicating that certain spatial arrangements may be beneficial to human well-being socially and psychologically. The paper draws from a range of landscape and urban design theory, field observation and research to reveal implicit common elements which lay foundations for a spatial conception based on linkages of locational, directional and transitional experiences. It is asserted that such spatial configuration is beneficial to human psychological functioning and, when certain other

characteristics are present, may offer restorative potential. Such restorative environments potentially contribute to the urban fabric as a preventative measure mitigating the impact of urban stress and helping to maintain the health and well-being of urban populations.

### **THE RESTORATIVE ENVIRONMENT**

'If you've ever been somewhere that renewed energy, bathed you in calm, inspired you, you will know that places can actually be *health-giving*' (Day, 2002,p.182)

That landscape settings have the capacity to benefit human health and well-being has become well established by research, particularly in the field of environmental psychology (Kaplan and Kaplan 1989; Ulrich,1984). Throughout history outdoor settings have frequently been created to engender restorative benefit in people, for example, by being spiritually uplifting or by stimulating benefits to physical and psychological health. At the start of the twenty first century however, in the midst of a renaissance in urban regeneration that calls for livable towns and cities capable of accommodating and sustaining contemporary urban lifestyles, urban open spaces that have restorative potential are perhaps more necessary than ever before. But, although the idea of a restorative environment can still be found applied to some health care facilities to provide healing or restorative gardens for the sick, its wider application has yet to be sufficiently explored.

The World Health Organisation states that health is not the mere absence of illness, but means physical, social and mental well-being (Mercer,1975). In this context the term restorative is used in this general sense to explore the potential of outdoor settings in towns and cities that can provide a general sensation of revival or renewal mitigating the stress and mental fatigue which can arise from prolonged exposure to some aspects of urban environments. Clearly the extent to which urban experience generates mental fatigue and what particular experiences might trigger it is largely cultural rather than physical or spatial and is likely to vary across individuals, age and ethnicity, for example. The implications of this for urban design seem set to get more challenging as urban environments become increasingly more complex and multi-cultural. A potential limitation of the concepts developed in this paper is, therefore, that they do not take into account cultural differences among town and city users. Nevertheless, as the Kaplans' point out, most people appear to become routinely fatigued because of the need to continuously manage increasing amounts and competing sources of information (Kaplan, Kaplan and Ryan, 1998). The term *information overload* has long since crept into the lexicon of contemporary Western culture highlighting that maintaining a focus on what one needs or wants to do whilst trying to screen out surrounding distractions often requires significant effort. The greater the effort expended the quicker that mental fatigue will result generating the need for restorative and refreshing experience. It is probably reasonable to assert that for many, if not most people, urban environments may usually present particular challenges in this respect because they tend to be where people are more inundated with large amounts of information continuously competing for attention. This distinguishes the focus of the paper from so called therapeutic site design, or healing gardens, mainly associated with managed health care settings and which claim, or at least aspire to, measurable levels of recovery in patients who are ill (Westphal,2000).

Our understanding of the restorative potential of the outdoor environment does, though, have early roots in institutional health care. About 500 BC the Greeks constructed asklepieia to aid recovery of the sick by means of patient wards with a southern orientation, open to the sun and facing an enclosed courtyard. The arrangement was designed to facilitate dreaming because the Greeks believed the subconscious to be instrumental to the curing process. Roman hospitals called 'valetudinarium', designed for Roman soldiers, also included a courtyard as a central feature of the hospital, designed to allow fresh air and ambulation, which the Romans believed were central to the recovery process. (Westphal,2000). Harnessing the landscape and natural elements to induce reflective and contemplative states of mind for restorative benefit has even earlier origins in Islamic paradise gardens. Created as ordered oases in otherwise hostile environments, paradise gardens were places of physical and spiritual replenishment representing the heavenly paradise described in the Koran. In Britain the later Monastic cloister gardens were

designed with patients' cells facing an arcaded courtyard offering sunlight, shade, seasonal plants and places to walk and sit. These gardens were also intended to induce a spiritually reflective mood by providing access to nature in a safe and ordered environment (Gerlach-Spriggs et al,1998). With the decline of monasticism itself, the significance of the restorative garden declined. Most subsequent hospitals, though a step forward in the study of medicine, were a step backward in terms of the patients' environment.

In the 17<sup>th</sup> and 18<sup>th</sup> centuries, the dual emergence of scientific medicine and the broad cultural movement of Romanticism combined to encourage the re-emergence of usable gardens for hospital patients (Cooper-Marcus et al,1995). The notion that infections were spread by noxious vapours gave rise to the 'Pavillion' hospital design, which paid special attention to hygiene, fresh air, and cross-ventilation. A series of separate wards joined together at their ends by a long corridor, like the teeth of a comb, provided spaces between the wards, which allowed for access to the sun and nature, and activities such as gardening. Romanticism prompted a reconsideration of the role of nature in bodily and spiritual restoration and these green spaces were sometimes intentionally arranged to form park-like spaces for convalescents, hospital staff and visitors alike (Gerlach-Spriggs et al,1998,p.22). Subsequently, changing opinions about the spread of disease and technological advances in health care favoured sterilized environments and gardens and courtyards as part of hospital design again began to decline.

The twentieth century saw one of the most rapid periods of social change in human history. In hospitals advances in medical science combined with technical advances in high-rise construction, along with increasing demand for cost-effective efficiency brought about more compact multi-storey medical complexes. If it was present at all landscape became largely cosmetic and bore no relation to historic ideas that natural areas could have a bearing on the healing process, stress reduction and the general well being of patients, staff and visitors. Westphal (2000) however, highlights that there seems, once again, to be a resurgence of interest in the therapeutic potential of the outdoor environment. Experiments like Roger Ulrich's influential study of surgical patients in 1984, in which he showed patients with a view of 'nature' recovered more quickly and took fewer drugs than a control group have perhaps contributed to this (Ulrich,1984). Landscape which is integral to the hospital complex is again beginning to be viewed as a resource to aid healing and improve well-being. There is a growing trend in hospitals towards creating therapeutic landscape, and a number of facilities are developing gardens. However, these contemporary developments continue to focus attention on the development of gardens in managed health care establishments which 'are intended to function as an adjuvant therapy within conventional western medicine protocols.' (Westphal,2000,p.19) and do not yet seem to have extended far into consideration of design in the wider public realm.

One prominent exception to this, however, lies with the work of psychologists Stephen and Rachel Kaplan who have conceptualized restorative experiences from contact with the natural environment (Kaplan and Kaplan,1989). Although the Kaplan's findings derive from a research programme in wilderness settings an interesting parallel can be drawn with urban lifestyles because they associate the restorative potential of the external environment with the mitigation of mental fatigue that can arise through long periods of concentration. The need to concentrate, according to the Kaplan's, wears us down and causes mental fatigue. They argue, however, that this is a special kind of tiredness that does not preclude engagement with certain types of activity that can assist recovery from mental fatigue. In general this is based on the relationship that exists between the mental world that can be imagined and the physical surroundings. Their work conceptualizes four characteristics of settings (being away, extent, fascination and compatibility) that, when combined, can facilitate this kind of restorative benefit (Kaplan, Kaplan and Ryan,1998). Being away refers to the capacity of the mind to wander and induce a sensation of being in another, desirable, location that is different from the one causing the fatigue, perhaps stimulated by a view through a window, for example. Extent is a characteristic of settings that offers the opportunity to contemplate breadth of scope and possibility. Places that may be relatively small but where boundaries are not easily discernible might offer such potential. Fascination refers to properties of places or things that engage and hold the attention by

stimulating a sensation of wondering and mental challenge. Finally is the requirement for a setting to be compatible with ones expectations and inclinations (Fig.1).

From this brief overview we can see that there is evidence to suggest that aspects of the external environment are thought to have a restorative capacity, at least in the sense of inducing reflective contemplation for psychological and spiritual replenishment, and that this has been understood in various ways for centuries. In recent times there seems to be a resurgence of interest in this and in particular it's potential for application in the site design of managed health care settings. We can also begin to appreciate some of the characteristics of outdoor settings that are associated with restorative potential. These seem to emphasise the importance of material elements and spatial configurations that can draw together the physical and mental worlds, stimulating the mind to wander, to contemplate and wonder, and to find satisfaction in the realization of expectations.

### **URBAN REGENERATION**

'To stem a long period of decline and decay, pessimism and under-investment, we must bring about a change in urban attitudes so that towns and cities once again become attractive places in which to live, work and socialise. (Urban Task Force,1999)

These ideas, although as yet underdeveloped in terms of their design implications, seem especially important in the context of new thinking in the urban environment. The Urban Task Force (1999) has set the socio-political agenda for this by calling for an urban renaissance in Britain to improve urban environments and encourage people back into urban areas. To make Britain's towns and cities not just fit to live in, but thriving centres of human activity has been said to be 'one of the key political challenges of the new century' (Urban Task Force,1999). A key priority for the Task Force is the creation of high density, compact, many-centred cities of mixed uses as they consider this the most sustainable urban form. One consequence of this might be to reduce the availability of land in urban centres for large tracts of green space, generating instead a need to look to smaller facets of public open space for respite and escape (Fig.2). Indeed, this change of emphasis is made clear in the Task Force report. 'To achieve urban integration means thinking of urban open space not as an isolated unit – be it a street, park or a square – but as a vital part of the urban landscape with its own specific set of functions. Public space should be conceived of as an outdoor room within a neighbourhood, somewhere to relax and enjoy the urban experience' (Urban Task Force,1999,p.57).

This much more holistic approach does now seem quite firmly embedded in contemporary thinking about the provision of public open space in towns and cities. At the Urban Regeneration conference organized by the ODPM and The Guardian Newspaper in London on 1 July 2004, at least six of the ten presentations made reference in one way or another to a desirability for networks, mosaics, or systems of linked open space, of different kinds, woven into the fabric of towns and cities. It was strongly suggested that a principal goal for urban regeneration in terms of open space policy should be the identification and development of such spatial continuities from spaces that may already exist, however small or incidental, or their creation in areas where they did not. Implicit in the general tone of the conference was that such spatial structures were believed to play a significant part in making towns and cities livable.

Central to this developing concept is the re-establishment of the street as the urban focus that provides for a web of connections offering people a range of choices and experiences as they move about. The tightly knit, mixed use Lanes district in Brighton is cited as a desirable example of this form of urban integration (Urban Task Force,1999). Streets and their capacity to connect a diversity of outdoor rooms may have potential therefore as components of a reconceptualised urban park in the regenerated and rejuvenated compact city. The idea of a network of small, restorative open spaces in an urban centre has been explored before in the context of urban planning, notably in a proposal by American landscape architect Robert Zion in 1963. Since the opening of Olmstead's Central Park, city planners focused their attention on large parks, ceremonial civic plazas, avenues and parkways. Zion did not accept the belief of the time that to

be viable an urban park needed a minimum of three acres to accommodate city crowds. Zion argued that New York would be better served by thousands of very small parks. In 1963 Zion proposed that the citizens of New York build a vest-pocket park on every midtown block of the city to create a matrix of parks. Together these parks would provide spaces for people to rest and gather strength before venturing back into the busy city streets of urban activity. In 1968 Zion's Paley Park, located at 53<sup>rd</sup> Street and Fifth Avenue opened. Zion imagined that vest-pocket parks like Paley Park would become, in Zion's words, 'not amenities, but necessities of city life' (Frankel & Johnson,1991,p.197). Paley Park was intended to be one of a hundred such parks, in an extensive network. Zion's dream was that each park would be 'as ordinary as, say the cafes of Paris' (Frankel & Johnson,1991,p.191). In fact Paley Park was the only vest-pocket park created by Zion in New York and it has become one of Manhattan's treasures.

To facilitate the implementation of their proposals, the Urban Task Force recommended the development of a national urban design framework to disseminate key design principles (ibid.p.84). This has resulted in a number of excellent publications, largely under the auspices of CABE and DETR, which have set the agenda for best practice in urban design aimed at achieving the Task Force's general objectives (Llewelyn-Davies,2000; DTLR,2000, 2001). There is evidence of their influence in the development of new approaches to the provision of green open spaces (DTLR,2002) and in local urban design strategies, for example Leeds City Centre Urban Design Strategy (Leeds City Council,2000). But, although all of these publications proclaim the importance of enhancing human life quality in the design of the urban environment, outlining in detail the components of design frameworks and approaches to achieve this, there is no explicit reference made as to how designed urban open space can be arranged to offer restorative opportunities to users. The implication left is that currently available design guidance will, if followed, result in places with intrinsic restorative merit as if it were somehow a by-product of a wider socially responsive agenda. Whilst this might partly be true there is sufficient evidence in the literature to suggest this assumption may be excessively broad leaving open the possibility that certain spatial characteristics and configurations, more specific to the realization of restorative potential, might remain overlooked. So the question here is how can we begin to take steps to overcome this possible limitation?

A place to start might involve a shift of emphasis from the properties and characteristics of individual spaces to that of networks of spaces as a whole. We have begun to see that the kind of 'attractive' towns and cities envisaged by the Urban Task Force seem to be increasingly associated with a conceptual shift in attitude favouring interwoven networks of small open spaces, including the streets that connect them. Implicit is that experience of such networks is psychologically beneficial to urban populations. This more holistic attitude to urban spatial arrangement, as interwoven networks of place experience, might also imply a more fluid and rhythmic approach to design, relevant to sensations of continuity as well as location. In terms of delivering restorative benefit, this might suggest that as well as thinking about the qualities of individual places, as particular locations that people might seek out for respite, we perhaps also have to increase our consideration of how they are experienced as an interconnected spatial continuity. If so, then a fundamental question relevant to the design of such settings is what are the material and spatial attributes of urban open spaces that can facilitate and enhance beneficial sensations of continuity and connectedness?

### **URBAN OPEN SPACE MOSAICS**

We can begin to explore this by returning briefly to Richard Forman's ideas about land mosaics (Forman,1995). Forman's position, after analysis of a wide range of landscape types, is that there are fundamental components of spatial organization observable in landscape and ecological systems and these are related to ecological integrity. If they are ecologically beneficial, he asserts, the same may hold for human systems. If this is accepted, then it appears to hold quite profound implications for urban and landscape design in particular, not least because Forman's spatial system is fundamentally very simple. Six basic principles can be drawn out that are relevant here:

1. At the root of Forman's system is that spatial arrangement itself matters. This is what gives the landscape its structure which determines movements and flows between different ecosystems. Certain spatial configurations occur because they are the ones that facilitate ecological activity best.
2. This spatial structure has a particular form reflecting that the real world consists of finely fragmented habitats arranged in a mosaic-like formation. Different parts of the mosaic aggregate forming distinguishable boundaries but always as part of the wider whole.
3. The detail of the mosaic is described by Forman in terms of the patch-corridor-matrix model where: patches are relatively homogeneous non-linear areas that differ from the surroundings; corridors are strips of particular types that differ from the adjacent land on both sides; matrices are the background ecosystem or land-use type. Land mosaics are patterns of patches, corridors and matrices.
4. The patch-corridor-matrix spatial structure is scale independent and can be detected at all levels of scale from the submicroscopic to the universal. At the human scale relevant to Forman's work, landscape, regional and continental scales are considered as three distinguishable scales of land mosaic.
5. Land mosaics are holistic spatial arrangements. 'It is simply inept or poor quality work to consider a patch as isolated from its surroundings in the mosaic. Designs, plans, management proposals, and policies based on drawing an absolute boundary around a piece of the mosaic should be discarded.' (ibid,p.xviii).
6. 'Form is the diagram of force.' (ibid,p.5). Forman identifies that land mosaics arise as a consequence of a combination of natural and cultural processes that change with time. Solar energy maintains and creates the structure in the landscape within which specific pattern is made by either/or combination of substrate heterogeneity, natural disturbance, human activity. The form generated is the physical manifestation of the underlying and dynamic forces.

Forman thus presents a conceptual approach to the arrangement of space in a supposedly environmentally and socially sustainable form. The fundamental characteristics of which are that it is essentially holistic consisting of distinguishable yet inseparable parts emphasising the primacy of linear and non-linear attributes arranged against a common background. The structure is mosaic-like and scale independent and expresses visually the forces that have acted upon the whole system. Crucial is that this kind of spatial concept is not confined to the field of landscape ecology. Instead, as Forman highlights himself, there is evidence for concurrence in other disciplines, including in particular, the point, line and plane principles at the heart of art and architecture, and the principles of urban imageability identified by Lynch (1960).

Echoes can also be detected in other facets of architecture and environmental design theory that may strengthen Forman's assertion about the importance of his spatial model to human systems. For example, useful, if perhaps rather abstract, foundations for this can be found in the phenomenological approach to the built environment advocated by Christian Norberg-Schulz in the late 1960s and early 70s (Norberg-Schulz,1971). One of Norberg-Schulz's principal concerns is to explore the nature of the relationship between human functioning and its spatial expression. At the most fundamental level he considers that human progression through and engagement with the material surroundings can be conceptualized in terms of a tripartite spatial structure which integrates sensations of proximity, continuity and change into a collective sense of place. Proximity represents the spatial expression of people's innate need to know their location. Continuity represents spatial sensations that make us aware of what is beyond the immediate location, and change represents where we become aware of transformation from one spatial experience to another (Fig.3).

The similarity to Forman's mosaic-like structure is at the very least intriguing. The spatial sensation of proximity seems resonant with Forman's patches, whilst continuity echoes the linear attributes of corridor. Norberg-Schulz sense of place is also assumed to include a less clearly

defined, but nonetheless coherent, general background called area that seems similar in principle to Forman's matrix. Furthermore Norberg-Schulz also alludes to the scale independence of his spatial schemata and to its holistic nature. According to Norberg-Schulz's concept, our sense of place, and by extension our existential well-being in the world, is intimately bound together with our subliminal connection holistically to these spatial sensations. Given the infinite breadth and complexity of the human relationship to the spatial world, Norberg-Schulz's hypothesis appears arrestingly concise. However, these abstract principles can be found manifest in different ways in the work of other architectural and urban design thinkers. Both Lynch and Alexander, for example, emphasise continuity of spatial experience as being important to the psychological well-being of urban populations, and that such continuity consists of a seamless connection of different spatial sensations which, at a fundamental level, seem broadly consistent with one or other of Norberg-Schulz's spatial types.

The connectivity between locational, directional and transitional spatial experiences are perhaps brought to clarity most vividly in Gordon Cullen's argument for the importance of serial vision to the experience of townscape. By drawing attention to the sequential nature of urban spatial experience, Cullen begins to elaborate the characteristics of urban settings that stimulate and sustain sequential experience. Two key themes overlay the diversity of examples that Cullen uses to illustrate how we can sense visual coherence and organization in urban settings. These are place and serial vision. Cullen articulates the sense of place fundamentally in terms of our reaction to the position of our body in the environment, stimulated by sensations of enclosure and our awareness of when we are outside it, when we are entering it, and when we are in the middle of it. "At this level of consciousness we are dealing with a range of experience stemming from the major impacts of exposure and enclosure." (ref p.9). For Cullen, sense of place is associated with our ability to subliminally monitor our position in relation to a kind of balanced tension between awareness of here and there. Furthermore, it is important that here and there are experienced in a fluid and dynamic manner, as elements along a continuity characterised by an unfolding sequence of existing and emerging views. Part of Cullen's aim here seems to be to change awareness of the urban realm away from assemblages of discrete locations to a more dynamic and plastic experience, "a journey through pressures and vacuums, a sequence of exposures and enclosures, of constraints and relief." (ref p.10). He calls this serial vision and what brings this experience alive is the drama of juxtaposition brought about by awareness of contrast and change: the locations at which here becomes there. Cullen believes these transitional experiences to be crucial to our ability to sustain psychological engagement with our surroundings. Without them "the town will slip past us featureless and inert." (ref p.9).

Cullen therefore, articulates a concept of urban form consisting of fundamental spatial properties, similar to the abstractions of Norberg-Schulz, in which diverse locational sensations are strung out in continuity, as rhythmical sequences of here and there, brought to life by the punctuating effect of spatial change and transformation. In both cases there is the strong implication that this kind of urban form is psychologically beneficial to urban occupants and therefore may have potential to contribute a spatial dimension to our understanding of restorative environments. These ideas have been implicit in the bedrock of urban design theory for more than thirty years and now seem to be especially resonant with current thinking about design approaches in urban regeneration. The following material aims to explore this in more detail. Firstly, by locating the general principle of sequences of locational, directional and transitional spatial experiences in the context of more recent theoretical investigation. This is followed by an account of recent field explorations that begin to reveal how these spatial concepts might be manifest in urban settings emphasizing restorative features. This culminates in a conceptual framework that identifies spatial properties and characteristics of restorative urban open space.

### **ALEXANDER'S THEORY OF CENTRES**

'We need to think more imaginatively about the kind of open spaces that can make a difference to the quality of people's lives in urban settings.' (DTER,2000,p.75)

The concept can be developed further, in terms of its content and geometrical implications, through consideration of aspects of the work of architectural theorist Christopher Alexander. Elements of Alexander's generally humanistic approach to planning and design in the urban environment are especially interesting in this respect, particularly his views about the spatial sensation of centre. This is rooted in Alexander's notion of order as an unbroken continuity consisting of distinguishable, yet inseparable parts. To this extent there is common ground with the concept of urban place advocated by Cullen, Lynch, the Urban Task Force and its successor publications.

One of Alexander's principal preoccupations throughout forty years as an architectural thinker and practitioner is with what generates wholeness in the environment. His work has led him to assert that the process that generates wholeness is called centering. For Alexander, centering is in essence, an elaboration of the idea of differentiating space, directly analogous with cell division, developed as part of his pattern language as the means by which different patterns are connected together to make more complex spatial wholes (Alexander, 1979). A centre is basically the spatial representation of the innate human tendency to externalize locational sensations in the environment. The concept of the centre has achieved considerable prominence in Alexander's world view and is elaborated in great detail in his most recent publication, *The Nature of Order* (2001, 2002, 2004). Alexander acknowledges a convergence of view between his own ideas about centres and that of Rudolph Arnheim's discussion about the importance to composition in the visual arts of centrality as 'the self-centred attitude that characterizes the human outlook and motivation at the beginning of life and remains a powerful impulse throughout' (Arnheim, 1988, p.2). Stephen Grabow (1983), Alexander's biographer, highlights similarities between Alexander's general attitude to the human-environment relationship and that of Christian Norberg-Schulz (1971). Indeed both make use of the word centre to describe locational sensations. The essential difference between them appears to be that Alexander's centres have a primarily visual meaning to do with the perception of centrality and locus in a visual field, whereas Norberg-Schulz takes a wider, more experiential meaning, as the bodily sensation of proximity in the physical world.

Alexander says that his ideas about centres emerged from an interest in analyzing the visual complexity of patterns in early Turkish carpets (Alexander, 1993). The ones he thought had greater quality seemed to possess certain visual properties that could be seen in the shapes, lines and colours making up the pattern. One of these properties seemed to have more significance than others because it seemed to control the overall sense of coherence and organization in the carpet pattern. This property was called centre and, for Alexander, became the building block of wholeness, not only in carpet patterns, but subsequently in all visual phenomena (Fig.4).

One of the defining characteristics of Alexander's centres is that they are not actually made of anything in particular, but are defined only in terms of order and organisation. 'Centers are made up of other centers. A center is an organisation (or field) of other centres. It achieves its significance to the degree that each of these centers which it is made of, is itself significant.' (Alexander, 1993, p.49). Unravelling Alexander's description is challenging, but essentially centres need to be understood in three ways simultaneously. First, that they are distinguishable as discrete entities like, for example, the Court of Lions within the Alhambra Palace. The Court has its own distinct identity within the overall Palace structure. Second, that centres are made by other centres at smaller scale. So, the Court of Lions has, nested within it and at different levels of scale, further centres that work together to make the Court a whole. For example, centres formed by the surrounding colonnade, the central open square and the way it is divided into quadrants that focus on the central sculpture, the ornamental detail on the columns and screens. Finally, that centres are located within, and contribute to, the resolution of larger surrounding centres. In this case we have to look at the Court of Lions, not just as a discrete spatial entity, but in terms of how it contributes to making the entire Alhambra Palace whole, by connecting to and

interpenetrating with surrounding spaces. Crucially, each connecting space is also a centre, but a centre that plays a transitional role as part of the whole (Fig.5).

The holistic interplay of these three properties of centre is essentially what Alexander means by a field of centres. The wholeness that an organisation of centres produces is not to be understood simply as an assemblage of parts but in terms of the organisation evident in the relationship of distinguishable parts which are inseparable from their surroundings. The objective of applying this particular geometric system to environmental design is effectively expressed by Alexander's biographer, Stephen Grabow. 'The overall character of these interactions is a very highly differentiated, high density spatial unit - a sort of maximum saturation of ordered interconnectedness, analogous to a poem which produces, with the bare minimum of elements, the highest possible degree of meaning' (Grabow,1983,p.201).

Returning momentarily to Cullen, we can begin to see his vision of townscape now as a complex field of centres woven together as a whole. Some centres may emphasise locational sensations, like squares and courtyards, some may have directional qualities, like streets, colonnades and passages, others still may engender transitional sensations, like gateways, arches, doorways and windows. Alexander's centres are not simply abstract principles but are intended to be a fundamental part of a deeper and more complex attempt to unify geometry, human experience, and spatial form and function. Alexander fervently believes that this kind of holistic spatial structure is intrinsic to all fulfilled human life because it is, in essence, an expression of a fundamental innate sense of order that primarily Western techno-scientific culture has become detached from. Achieving and sustaining human well-being means, for Alexander, acknowledging that there are geometric and spatial dimensions to human fulfillment and that this should be reflected in the arrangement of our towns and cities.

### **URBAN FORM and SOCIAL SUSTAINABILITY**

Further evidence can be found by exploring a branch of urban design theory concerned with social sustainability, and in particular the interrelatedness of certain spatial forms and social interactions in neighbourhoods, streets and communities. For example, research undertaken by Hillier and Hanson (1984) explores the social potential of urban outdoor space and its relation to networks of convex spaces that can be discerned from figure-ground plans. Hillier and Hanson's assertion here is that the quality of human communication in neighbourhoods correlates with the presence and density of 'beady-ring structures' (Hillier and Hanson,1984,,p.90). In essence these consist of points within small convex spaces, discernible by analyzing the nature of the site's physical containment, connected by paths between them. The denser the resulting mosaic, the better the potential is for the spatial configuration to sustain a positive social life (Fig.6). Something similar is also espoused by Christopher Day who refers to the value of convexity, as a spatially containing geometric feature, to the sense of comfort and welcoming in living spaces (Day,2004). Alexander also considers that good social spaces are essentially convex and should give the sensation of being contained but not trapped. (Alexander et al,1977).

Hillier and Hanson claim that social potential can be quantified through analysis of the spatial structure and the way it is connected together. The implications are quite profound in that social interactions are thought of as interdependent with the spatial organization in which they occur. 'Society must be described in terms of its intrinsic spatiality. Space must be described in terms of its intrinsic sociality.' (Hillier and Hanson,1984,p.26). This conclusion follows almost literally the earlier assertion of phenomenologist Maurice Merleau-Ponty that the existential and spatial dimensions of human life were interchangeable. 'We have said that space is existential; we might just as well have said that existence is spatial.' (Merleau-Ponty, 1962, p.293). He too believed that developing an understanding of the theoretical and practical implications of this philosophy was crucial to achieving and sustaining fulfilled human lives. Although Hillier and Hanson's work is complex in terms of its mathematical expression, the nature of the spatial configuration they identify is essentially very simple and seems to resonate closely with characteristics identified from theoretical material considered earlier. To this extent Hillier and Hanson contribute

significantly to the development of a socially beneficial spatial model strengthening empirically the case for holistic spatial configurations consisting of interwoven locational, directional and transitional spatial experiences.

More recent theoretical and field based explorations help to amplify this model with more detailed properties and characteristics relating specifically to issues of social sustainability and restorative potential. Porta and Renne (2005), for example, have developed a set of formal indicators of social sustainability and described their application in the analysis of towns in Western Australia. Eight indicators are presented as ways in which the social sustainability of streets can be quantified. When viewed in the light of the emergent locational, directional and transitional spatial model, we can see that Porta and Renne's indicators begin to add detail to these basic spatial types. For example, the indicators social width, visual complexity, number of buildings, and sedibility, all relate to measures of the locational attributes that give a roughness, or fine-grain quality, to streets, intensifying their social potential and making them more than mere conduits of movement. The indicators façade continuity and sky exposure help weave this complexity together maintaining the sensation of direction, whilst simultaneously providing a further dimension of enclosure. Another of Porta and Renne's indicators is softness and this highlights the need for there to be transparency and transitional sensations. For example, to be able to see from where one is into other realms, by means of windows, for example, or other spatial features that encourage viewing in and out, and also to the need to be able to make, and experience, the sensation of transition from here to there (Table.1), (Fig.7).

A specifically restorative dimension to this developing spatial model can be revealed through consideration of the outcomes of detailed exploratory research carried out by Beth Helleur (2001). Helleur applied a comprehensive review of the literature in this field to the observation and analysis of a wide range of public places in Europe and America. The study contributes towards identifying a wide range of specific properties and characteristics associated with restorative benefit. Substantial evidence was presented demonstrating a wide range of argument in favour of the restorative potential of the natural and man-made environment and, if common ground can be discerned from these different perspectives, it seems to be that people benefit from, and respond positively to, contact with the external environment when it is responsive to their emotional, functional and behavioural needs, and that there are evolutionary (Appleton,1975; Lewis,1979; Ulrich,1993); aesthetic Lynch (1960), Carr et al (1992), Tibbalds (1992), and Bentley et al (1985); and psychological (Ulrich,1979, 1984, 1993; Kaplan and Kaplan 1989; Cimprich, 1992; Canin,1992) dimensions to this. Helleur (2001) concluded that successful restorative urban settings are likely to hinge on the development of spatial networks which must give consideration to issues of density, size and location.

**Density:** Wherever possible, restorative open spaces should be evenly located throughout the urban fabric of city centres in order that they are within easy reach of all users. Restorative public spaces should be adjacent to shops, places of work, public buildings, houses and flats in order that people can walk easily to them from anywhere in the city centre. Helleur considered it important that there is always a restorative urban open space close by so that the spaces can be experienced as part of everyday urban life. This means that if, as Llewelyn-Davies (2000) recommends, they were under five minutes walk away (approx. 400 metres), they would be at a minimum density of 5 per square kilometre.

**Size:** Research suggests that size is not important to whether or not a space can provide restorative benefits (Ulrich,1984; Kaplan & Kaplan,1989). Within the large-scale environment of urban areas, small-scale intimate spaces with human scale would seem to provide a good restorative setting, by providing a comfortable space responsive to human needs. Whilst being small enough to feel intimate and provide human scale, restorative public urban spaces need to be large enough to absorb enough people. Kevin Lynch (1971) suggests that dimensions of 40 feet appear intimate in scale; up to 80 feet is still a pleasant human scale; and that most of the successful enclosed squares of the past have not exceeded 450 feet in the smaller dimension.

Location: To create the network of restorative spaces at the required density, a large number of sites need to be found within the existing fabric of urban areas. But, only small pockets of appropriate land need to be found to create a network of restorative urban open space. Imaginative use of existing open spaces is required and urban brownfield land presents opportunity in this respect. 'In England today, 58,000 hectares of brownfield land (equivalent to an area the size of the West Midlands conurbation) is either vacant, derelict or available for redevelopment and more becomes available every year.' (DTR,2000,p.54). Planning authorities should ensure that built development on these sites includes attention to the provision of pockets of accessible public spaces, and equally importantly, to their connection to the wider urban network.

The individual spaces which form the network must be understood, not as discrete settings, but as unique and distinguishable parts of a larger whole. What seems especially important is that whenever harshness or intimidation, or any other of a range of undesirable sensations likely to occur in the urban environment, is experienced, then there should be places, readily available and within easy reach, that can offer feelings of ease. Such places, it seems need to deliver a range of experiences associated with providing relief from the mental fatigue likely to be experienced by most people at some time or another as a result of urban living. These experiences include: inducing reflective contemplative sensations; combining mental and physical worlds; offering conceptual escape, allowing the mind to wander; stimulating wonderment; being compatible with expectations. They should also be designed to be sustainable and enduring, partly because, as O'Brien recently pointed out, 'Once places become part of a person's identity, then changes or loss of that place can have a significant impact' (O'Brien, 2004, p23).

We have, then, an emergent spatial structure of restorative urban open space, which moves away from the idea of large discrete open areas that people purposefully go to in order to seek respite and rejuvenation, to more of a web or mesh like structure that links together a system of smaller spaces, woven into the fabric of cities in a more holistic way. Each space and the links between them may be designed in such a way as to encourage restorative experiences and Helleur (2001) begins to identify some of the properties and characteristics that can bring this about (Table.2).

## **CONCLUSIONS**

There is growing evidence to suggest, not only that there is a need in contemporary urban regeneration for public open space provision to be reconceptualised in terms of networks of small linked spaces of various kinds, but that this kind of spatial arrangement may in itself be socially beneficial and may have a restorative potential, arising mainly from its capacity to facilitate social interaction and help induce contemplative psychological responses. Other significant features include the experience of connectivity, so that the spaces making up the network can be experienced as special and significant in their own right, but not to the extent that they become perceived as detached. One way to accomplish this may be to make more explicit the fundamental nature of how people journey through space, in a joined-up way; physically and visually. A frequently occurring theme in the material considered for this paper is that most spatial sensations, at their most fundamental, fall into one of three categories relating to the sequential experience of moving through space. They either emphasise: proximity, or location; direction, or continuity; transition, or change (Fig.8). It appears important that these spatial sensations are experienced holistically and, geometrically, can be conceived as mosaic like configurations with distinguishable components that aggregate into larger more complex wholes. Geometrical systems that are amenable to scale independence, the nesting of components within one another, the sequential experience of change through movement and vision, need to be developed to aid design decision making. Principles derived from Alexander's concept of centres may offer productive foundations for exploring this further. The routine experience of these three spatial sensations seems to be required, regardless of whatever else might be involved, to sustain social and psychological health. Helleur's (2001) research also suggests that, for this

kind of spatial arrangement to deliver restorative benefit, it must also collectively and in its parts: induce reflective contemplative sensations; combine mental and physical worlds; allow the mind to wander; stimulate wonderment; and be compatible with expectations (Fig.9).

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**Table 1. Formal Indicators of Social Sustainability in Streetscape**

Developed as a means to measure quantities of each indicator evident in sequential photographs of streets taken at 25m intervals.

<b>Indicator</b>	<b>Measurement</b>	<b>Significance</b>
<u>Sky Exposure</u>	The amount of visible sky in each photo.	Indicates the street's ability to encapsulate the pedestrian.
<u>Façade Continuity</u>	The continuousness of the building façade.	Contributes to a sense of enclosure and definition.
<u>Softness (Transparency and Transitional Space)</u>	The amount of window area (transparency) and visually accessible space (transitional space) that fronts onto the street.	Elements that can make a street environment feel safe and welcoming.
<u>Social Width</u>	The breadth of the street as it effects human interaction across the traffic area.	Indicates the severance effect that traffic lanes and other features place on human interaction from one curb to another.
<u>Visual Complexity</u>	The amount of visual variety in the street, specifically in terms of colour, façade detail, street furniture, pavement.	Describes the degree to which the street has a rich visual tapestry.
<u>Number of Buildings</u>	The apparent quantity of buildings visible in the photographs.	Indicates the scale of the street in relation to the potential for human activity.
<u>Sedibility (after Whyte,1988)</u>	The measure of the number of seating opportunities visible.	Indicates the potential of the street in terms of opportunities for social contact and interaction.
<u>Detractors</u>	Negative features on street social life (blank walls, aggressive automobile facilities, rejecting objects eg. poor graffiti, large dumpsters, low quality light poles etc.)	Indicates the negative effect of a street to provide a good scene for flourishing urban social life.

**Table 2. Some Spatial Properties and Characteristics of Restorative Urban Open Space**

### **THE NETWORK**

- **Density:** evenly distributed on pedestrian routes (max 400m intervals)
- **Size:** generally small in scale and contained (15-20 x 30m)
- **Location:** adjacent to shops, places of work, public buildings, dwellings etc

### **THE INDIVIDUAL SPACES**

Collectively they should:

- induce reflective contemplative sensations
- combine mental and physical worlds
- allow the mind to wander
- stimulate wonderment
- be compatible with expectations
- stimulate directional, transitional, or locational sensations

### **Directional Spaces**

Engender sensations of continuity, a sense of there-ness and future possibility through, for example:

- Deflective facades
- Façade continuity
- Rhythm of boundary treatment
- Linearity of floorscape
- Sense of perspective
- Sense of mystery and anticipation
- Views and focal points

And should contain along their length a range of transitional and locational spaces

### **Transitional Spaces**

Engender sensations of change or transformation through, for example:

- **Thresholds:** boundaries between spaces marked by change in: material, texture, colour, form/shape, direction, level
- **Segments:** spaces that break linearity and provide 'softness' through: porticos, arcades, colonnades, shelters, low fencing, stoops, porches and landings etc.
- **Corridors and Tunnels:** narrow routes between buildings enabling access to interior courtyards or through routes to neighbouring spaces.
- **Ephemeral:** transient effects of sun and shade patterns, seasonal change in vegetation, sounds, smells etc.

### **Locational Spaces**

Engender sensations of here-ness, location and proximity through, for example:

- **Separation from Distraction:** removal of actual or perceived dangers (traffic, road crossing, muggers) or confusing or attention grabbing features (signs, adverts, shop displays, crowds, beggars) to engender a feeling of security, retreat from stimulation – to allow one's guard to be let down.
- **Provision of Access:** physically and visually accessible to all and connected to main points of circulation. Welcoming.
- **Provision for Comfort:** opportunities for physical and psychological comfort, physical and micro-climatic shelter, sedibility; sit, lie, sleep – a chance to 'do nothing'
- **Opportunities for Contact with Nature:** physical and visual access to flora, fauna, water, sky; 'Natural sounds' – wind, leaves rustling, bird song, moving water
- **Opportunities for Interaction with the Environment:** physical and psychological engagement with space and contents; Opportunities to make temporary spatial claims

(moveable chairs); Gradual attachment of significance over repeated visits, the building up of overlapping memories

- **Opportunities for social interaction:** meeting places, chance encounters, features of interest as talking points, seating in social groupings.
- **Imageability:** functional uses, goals and motivations, memorable physical features and social meanings.

## FIGURES and TABLES

Fig.1	Many of the characteristic yards of Kendal, Cumbria offer a sense of being away from the busy high street, induce the experience of extent through contemplation of the wider possibilities behind doors and windows and what might lie beyond the openings to adjoining spaces. Fascination is provided by fine grain detail in doorways, on walls and the way yards are often personalized. If one seeks food, drink and rest then these yards are frequently compatible with such expectations.
Fig.2	If large tracts of land become less available for green open space then we may have to look to create networks of smaller public spaces and streets as alternative urban parks in towns and cities.
Fig.3	Location, Direction, Transition and Area. After Norberg-Schulz (1971)
Fig.4	The dense network of centres Alexander observes in the border design of a 16 <sup>th</sup> century Seljuk prayer carpet. This design has high quality for Alexander because the entire design can be seen as an interlocking composition of centres with no left over space. After Alexander (1993).
Fig.5	A field of centres in the Court of Lions, Alhambra Palace.
Fig.6	Convex spaces and beady ring structure arising from analysis of the figure ground plan of Poundbury, Dorset from field research undertaken by the authors. After Hillier and Hanson (1985)
Fig.7	A Vienna streetscape with many of the characteristics of social sustainability explored by Porta and Renne.
Fig.8	Locational, Directional and Transitional spatial experiences.
Fig.9	A holistic spatial organization of location, direction and transition.
Table.1	Formal Indicators of Social Sustainability in Streetscape
Table.2	Some Spatial Properties and Characteristics of Restorative Urban Open Space