

Exploration and discovery: a nonlinear approach to research by design

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The last decade in landscape architecture has been characterised by calls to increase the intellectual capital of the discipline, and by responses to these calls. The 1990s began with James Corner's two part *Landscape Journal* article which reviewed the history of the idea of theory in landscape architecture. Corner found the discipline wanting in its ability to use theory to 'help figure and orient the collective unconscious of a modern culture still caught in transition' (Corner 1991 p131). In 1992 John Dixon Hunt accused landscape architecture of a 'poverty of discourse' of which its 'ignorance or cavalier disregard of history' is merely a part (Hunt 1992 p285). Steven Krog suggested that landscape architecture is in a 'crisis of belief' demonstrated by 'the triumph of attitude over insight and authenticity' and 'little depth of thinking' (Krog 1991 p100).

One of the ways the discipline has responded to this criticism, at least on the academic side, is with a new interest in research, and in the refereed article.¹ New journals have appeared, *Landscape Review* being one of them, and educators are being encouraged by their institutions to involve themselves in funded research (by both carrot and stick methods). One very welcome aspect of the turn to landscape research has been the recent development of the refereed studio as a way for studio tutors to participate in research (Bowring 1997). The basic idea of the refereed studio is that a landscape school studio project is framed as an investigative design programme. The programme reflects the educator's interests and explores issues which are specific to landscape design or, more precisely, explores issues which can most tellingly be investigated through design.

The role of research in landscape architecture, then, is getting quite a lot of airplay. Landscape architecture needs technical research, but that is not the kind of intellectual capital that Corner, Hunt and Krog regard as most important nor, I believe, is it the kind of research that the refereed studio can most profitably address. A critical engagement with history, culture, art and nature (a theme common to the above writers) is what landscape architecture needs most. While Corner warned against the nihilistic excesses of avant gardism, and Krog bewailed the 'storefront design religions' which produce flashy but empty landscapes, underlying their critiques (as I read them) was an urgent call for new philosophies. Not new objects or processes, but new ways of seeing. New interpretations of traditional concerns rather than a wholesale jettisoning of that which we have received from the past. Although the critiques of Corner, Hunt and Krog now seem like such a long time ago, the need for theoretical

¹ Other responses have been considerable: the development of a theoretically grounded European school of landscape design (Dutch, French and German in particular), the pioneering work of Leon Van Schaik and Peter Connolly in the development of critically engaged studio programmes at RMIT, and

advancement and for new perspectives on landscape thinking and practice is always with us. This paper therefore addresses the possibility of the invention of new concepts within a context of continuity, both of the values and traditional concerns of landscape architecture, and the ongoing critical enquiry into these.

The paper has a dual theme: integration and exploration. It asks two related questions:

1. how can we do research in this holistic discipline without separating the subjects of this research into artificially discrete parcels of activity, and
2. how can we explore the possibilities of landscape design without condition - how can we research by design *unconditionally*?

A recent article in *Landscape Design Extra*, a British landscape architecture periodical, discusses issues that arose at a meeting of the British Schools of Landscape Architecture Research Working Group (Thwaites, 1998). The Working Group had concluded that research in landscape architecture needs to progress on two fronts:

1. through exploiting opportunities derived from consultancy (an approach which argues for strengthening ties between education and practice)
2. through the intellectual development of the discipline (a call for a wider and more coherent theoretical framework for design)

What struck me about this discussion was the way it brought together research, consultancy and design. It hinted at an integrative model of landscape research, and paved the way for the development at UNITEC Institute of Technology (where I teach) of a research centre which could act as a focus for integrated research. Accordingly, in 1998 staff members of UNITEC's School of Landscape and Plant Science established the UNITEC Landscape Unit. Many staff have been involved in design outside their UNITEC commitments; the Landscape Unit, conceived as the consultancy wing of the school, harnesses this energy and directs it into projects which further the research and teaching objectives of the landscape section. The school received endorsement for the Unit from its Advisory Committee, composed principally of practising landscape architects and other industry representatives. The Advisory Committee felt that the formation of the Unit was a useful way of addressing a commonly cited problem in design education: this is the claim that the parameters within which landscape architects

the advent of the LOLA series of conferences at Lincoln University, to mention only a few.

operate in the 'real world' are quite different from the 'artificial' and highly conceptualised environment of the design studio. They felt, as did landscape architecture staff, that the Unit offered a mode of educational delivery that could help dissolve the barriers between real and artificial, between theory and practice.

Practitioners and staff also agreed that students typically have little exposure to the possibilities inherent in design strategies that are generated out of the constraints and opportunities of professional practice. This means that they may not develop the skills required to turn poorly written and unexciting briefs into appropriately theorised projects that engage and challenge them, while at the same time fulfilling the more prosaic requirements of the brief. So far so good. However, it is often argued that, conversely, recondite landscape design theory developed in studio and seminar needs to be tested before the tribunals of client and community for robustness and relevance.

But a model of landscape research that simply uses 'real world' opportunities to test research hypotheses developed in an academic environment is more likely to exacerbate than to dissolve the boundaries between theory and practice. It can amount simply to testing the unknown against the known, the radical against the conservative, the imagined against the given – a procedure which can relegate studio-developed designs to the 'impractical,' the 'otherworldly,' and the 'irrelevant.' This can mitigate against the development of new ideas and does not necessarily push design investigation beyond the problem-solving level. An integrative research model should not rely on a distinction between theory and practice for its validity or efficacy. This is where the refereed studio comes in. In 1997 Dr Jacky Bowring of Lincoln University published an article in *Landscape Review* suggesting that 'the refereed studio follows the model of any research project carried out with a team of willing and active researchers. However, in this case, research equates with design.' Bowring outlined the criteria for 'research by design,' (the rationale of the refereed studio): 'clarity of objectives; relevance and insight; creative and innovative process and presentation; and outcomes which are coherent, original and fruitful' (Bowring 1997 p54). These criteria are extended in the procedures of another research by design initiative, the CHASA Refereed Design Scheme,² by the inclusion of a category that requires the work to be a contribution to the cumulative body of knowledge of the discipline. The relevance of the refereed studio for my discussion is, first, that these criteria can be fulfilled without reference to practical efficacy, and second, that the evaluation of such design research is conducted by peers who are required to engage critically with the theoretical programmes that inform it.

Accordingly, the Landscape Unit was conceived as a vehicle for undertaking refereed studios, and would therefore have to conform to the requirements for such studios. These requirements, as set out

² CHASA Refereed Design Scheme Procedures 1997 no page number)

in Bowring's article, 'are those of any research project,' namely, a clear statement of objectives, the critical review of substantive focus, the presentation of process and the review of outcomes (Bowring 1997 p54). Unfortunately there is a danger that this model could become counterproductive by being overly deterministic. By 'deterministic' I do not mean that the finished design is univalent, rather that the outcome is predicted by the means - pressing certain buttons yields certain results, such as legibility, functionality and shareable meanings.

What is the problem with such results? In landscape architecture, as in other design disciplines, one of the recent permutations of thoughtful practice has been a renewed interest in *modus operandi* (Corner 1999, Rowbotham 1999, Allen 1997). With landscape being understood not so much as a physical network of enduring structures of cultural meaning, than as a way of *constructing* culture which continually changes through time (Cosgrove 1998), less emphasis is being placed on meaning as a generator of design than on the poetics, if you will, of landscape architecture. That is to say, on the processes involved in the making of designs. Put simply, designers are becoming more interested in means rather than ends. Indications of this renewed interest in what I call the poetics of landscape architecture include a broadening of the scope of design process, and the introduction of new media and practices of visual communication.³

This focusing on process⁴ is attended by a revaluation of representation in landscape design. It is now a truism that representational techniques and conventions structure and condition the outcomes of design (Cosgrove 1999). For instance, the ordering of space implicit in traditional techniques of cartography and perspective expresses a world view for which the human observer is the permanent focus and occasion (Monmonier 1993). Such a representational methodology now seems inadequate both to the flux and contradictions of contemporary life and to the landscape as 'active surface', the physical processes and events which structure and condition human lives.⁵ It is also inadequate to the forces which comprise (and reveal) the interpenetration of human subjectivity and natural systems. These days landscape architects, influenced by the decentring accounts of the 'web of life' now common in ecology and evolutionary biology, are less inclined to see nature as somehow 'out there' and

³ For examples of this broadening of design process see Simon (2000), Bradbury 2000, Lynn (1999), Corner (1998)

⁴ I say refocusing because the recent emphasis on *modus operandi* is reminiscent of (and could even be regarded as a continuation and extension of) the interest in design process in the early 1960s, for instance Haplin's studies for Sea Ranch. I owe this observation to Mike Austin of the School of Architecture, UNITEC Institute of Technology.

⁵ This theorising of landscape as a dynamic and constitutive 'field' or spatial matrix has come more from architecture than landscape architecture, and reached its best known airing in *Architecture After Geometry*, a special issue of *Architectural Design* (1997). Rowbotham (1999) applies it to urban landscape design and Wall (1999), with a nod to the notion of 'field conditions' (Allen 1997, Corner 1999) usefully reformulates landscape as 'the functioning matrix of connective tissue that organises not only objects and spaces but also the dynamic processes and events that move through them.'

'for us.' Instead, the anthropocentric humanism implicit in such a viewpoint⁶ is regarded as contributing to the division of humans from the natural processes that both surround and constitute us.

If Corner said ten years ago that 'we' are caught in a moment of transition, nobody would doubt that we are still so caught. Exploration is a characteristic of transitional times. 'We' therefore need a research model appropriate for exploration. The problem with the refereed studio as outlined above is that it may encourage a tendency (for legitimisation purposes) to frame research by design in much the same way as an experiment in biology or generative grammar, by cleaving to a 'scientific' model of research of the hypothesis-testing variety. An example of the determinism that such a model implies is found in Motloch's *Introduction to Landscape Design* (1991), where he states that '...problem definition consists of two major components: the definition of human needs, which is generally referred to as programming; and the definition of site structure and function, and the opportunities and constraints these afford, a process called site analysis.' The functional diagram, he says, 'can facilitate the discover and exploration of *desired* organisational and spatial relationships.'⁷ These are then evaluated against pre-formulated criteria. I believe that a truly exploratory design process will not require the evaluation of competing schema according to objectives or criteria and then 'selecting the winner.' Another example of deterministic design is found in Filor (1994). In an article which promotes the 'designer's own vision' as 'the most important component in the process of design' Filor argues that problem-solving 'is usually achieved by a designer's initial conceptualisation of a design solution which can be used as an ideal model against which to test the constraints and opportunities imposed by the site and the requirements of the brief and the users.'⁸ Alluding to Christopher Alexander, Filor writes 'that every project must first be experienced and then expressed as a vision seen in the inner eye, so strongly that it can be communicated to others' (Filor 1994 p124). He cites Hiller and Leaman, who argue that the designer's preconceptions 'are what makes design possible at all, and indeed what makes possible the identification of a design in the first place.'⁹ I am not claiming that these descriptions of design process are somehow wrong or unfelicitous, or that design is simply not like this. Instead I am suggesting an alternative, another way of doing landscape design which may be more likely to result in new insights. Filor regards landscape design as the process by means of which useful, comfortable and attractive spaces and places are achieved as a result of the manipulation or management of a site. Most landscape architects would agree with some version of this definition. When landscape architecture is truly *creative*, however, it encompasses something more than this definition. New ways of seeing, new concepts, are not guided by objectives or guidelines. 'Concepts are not waiting for us ready-made, like heavenly bodies. There is no heaven for concepts. They must be invented, fabricated, or rather

⁶ The iconic, modernist designs of Halprin, Kiley and Jellicoe exemplify this humanistic understanding of the world

⁷ my italics

⁸ Filor draws on Steadman (1979) in the elaboration of this argument.

⁹ Quoted in Filor (1994) p124

created and would be nothing without their creator's signature' (Deleuze and Guattari 1994 p5). But, as Nietzsche warned, after we have created new concepts, we must present them and make them convincing.¹⁰ And it is to this aspect of research by design that I now want to turn.

When design is conceived as an investigative tool like the classical laboratory experiment, the spurious distinction between design theory and design practice (where design is 'applied theory') will disappear *if and only if* design 'outcomes' are not already forecast by a set of 'objectives'.¹¹ After all, the most obvious way of legitimising (or even realising) the design-as-research paradigm is to establish an experimental framework that begins with a hypothesis or research question, follows a methodology, and eventually emits design outcomes that can be 'tested' in a variety of ways, from practical efficacy through to aesthetic considerations. In this model a range of performance criteria which a landscape design must meet are arrived at (by considering a range of issues including the physical and research contexts). The success or failure of the design is established by how well these criteria are met. Obviously, there is room for flexibility – the criteria range over social and cultural as well as formal, physical, and ecological measures or standards. Who establishes the criteria, where and why they are established, and according to which social, cultural and political agendas, are important issues. Typically the criteria are set up before design begins. The problem is that this may have the effect of influencing design, by pre-selecting options for instance, or imposing constraints and limitations, or requiring a certain representational order.¹² In short it can become a deterministic model. The model I explore in this paper has been developed to overcome determinism in design, to break down the theory/practice and studio/real world distinctions and, in doing these, to see whether new discoveries can be made. It begins with the conclusion of the British Schools of Landscape Architecture Working Group stated above, that research in landscape architecture needs to progress by means of a critical engagement of education with practice (and vice versa) and by the development of more explicit theoretical frameworks for design.

The UNITEC Landscape Unit attempts to bring these objectives together. In the 'scientific' form of this research/consultancy/design model, the Landscape Unit may well treat a commission like a research project, as outlined above, with a hypothesis, methodology and conclusion, on the model of a refereed studio. This requires that a programme of theoretical investigation be developed for each project. Clearly, such a programme does not rule out incorporating a theoretical agenda formulated specifically

¹⁰ cited in Deleuze and Guattari (1994) p5

¹¹ This forecasting can take many forms, from the public authority requirements for 'improved pedestrian connections,' 'reinforcement of civic values,' 'stimulation of appropriate development' (all from Auckland City Council's *Aotea Precinct Design Guidelines*) to the studio tutor's marking schedule which requires x, y and z.

¹² Examples of this: 'At least one perspective, elevation or montage should be included.' 'Drawings will be displayed on presentation screens that will permit each drawing to abut the adjacent drawing.' 'The concept plan should be scaled 1:500' (all from Auckland City's *Aotea Precinct Design*)

to destabilise student thinking and move them beyond the normative representational order often associated with public works projects. In my experience there are many advantages are to be gained within the limits imposed by this model. For instance:

- a commission can be treated like a research project
- theoretical issues can be brought to a project (practical framework for theory)
- staff bring real projects into studio
- students can participate in each phase of project from design concept to detail design
- ties between education and practice are strengthened

These practical and important outcomes do address some of the concerns of the British Landscape Research Group. Certainly the range of educational opportunities to be derived from consultancy are well-covered. The 'scientific' research model outlined above definitely is suited to this purpose. It is difficult, however, to escape the determinism of a model that requires that certain objectives and criteria be met in order for the designs to be evaluated as more or less successful. It is my view that, while this approach has its place, it does not contribute to the intellectual development of the discipline (at least in the way that Corner, Hunt and Krog had in mind), and thereby fails to address the second conclusion of the Research Group.

What kind of research model will avoid cleaving theory from practice?

One way of dissolving the practice/theory distinction (and the implied real/artificial distinction that gets attached to it) may be through the elaboration of an approach which focuses on the process of design rather than on the products of design. This approach would be concerned with how ideas are brought forth rather than the ideas themselves. It is more like the voyage of discovery that the 'radical' philosopher of science Paul Feyerabend describes in *Against Method* (1993) where he argues that the only feasible explanations of scientific successes are historical explanations and that anarchism should replace rationalism in the theory of knowledge, with a view to enhancing serendipity.

Similarly, I am advocating a model which describes a process that has no prior object or content, a process that does not follow rules but creates them. The qualities to be found in landscape architectural design that travels without a destination can be found in all forms of work (including scientific work) which eschew method, despite discipline, genre, location or technical form; despite the material and cultural conditions that inform them. If design is conceived as a process of discovery the result of which is unknown (ie not already imaged), and if the process of design is to be as free as possible, then the representational order should be correspondingly unconditional.

Guidelines).

It may be claimed (and this is Nietzsche's point) that a research model that shuns objectives against which outcomes can be tested is no research model at all. My proposal adapts a well-known characterisation of scientific activity in order to address this issue. The history of science teaches us that much genuine scientific discovery is made when scientists do not know what they are doing or where they are going.¹³ Feyerabend goes so far as to conclude that '(t)he only principle that does not inhibit progress is: *anything goes*' (Feyerabend 1994 p14). He cautions scientists to focus on 'practice' rather than 'method,' and demonstrates that methodology is neither value-free nor the key to progressive results.¹⁴ The more conventional characterisation of scientific work describes two phases: a context of discovery and a context of justification. It is generally agreed by scientists, science historians and philosophers of science, that in the discovery phase insights can come from anywhere.¹⁵ It is the context of justification that requires rigour and standards. Both phases are important. After all, we need to be able (eventually at least) to explain what has been discovered. We must be able to communicate it and place it squarely before the tribunal of peer review. Landscape *design* occurs in the context of discovery. In the studio environment the context of justification, of explanation and evaluation, is the critique, or jury review (wherever it may happen).

So just what kind of design research am I talking about? I have been experimenting (and I stress the experimental nature of this work) with an attempt to extend design-based research beyond a linear model of research, which typically moves from hypothesis through investigation to conclusion. This model tends to separate the human agent from the 'problem', the human subject from the objective processes that are being studied. A 'nonlinear' model of landscape design is proposed, which introduces uncertainty and indeterminacy into a design methodology which can, in the pursuit of justifiable outcomes, become overly rationalistic or even mechanistic. It is also designed to destabilise the scientific rationalism that sometimes characterises the very notion of research in the social sciences. Many landscape educators interested in design methodology have looked at this before, and the survey - analysis - design prototype has been significantly enriched by their work. I do not wish simply to extend their work, however, but (in a general and, in this paper, limited way) to revisit the assumptions and theoretical ideas that underpin it. For instance Motloch states '(d)esign processes are not linear in character nor definite in length' (which I agree with) but goes on to add that '(d)esign is, however, goal-oriented' and problem-solving in essence' (Motloch 1991, p239-240). It can be, but it need not be, and I have suggested that the invention of new ways of seeing in landscape architecture requires a design process that is free from such restrictions. Another example is Steinitz (1995) for

¹³ See, for instance, the autobiography of physicist Werner Heisenberg or James Gleick's (1998) narrative of the slow emergence of nonlinear dynamical theory.

¹⁴ For discussions of the 'value-ladenness' of theory see also Quine (1994) and Kuhn (1970)

¹⁵ The biographies of scientists are full of accounts of serendipitous insights had while fishing, sailing and walking in the woods rather than toiling in the laboratory.

whom '(t)he design itself ...is the medium of social communication.' This is analogous to the view that landscape design 'requires a sender with a message, a medium of expression, and a comprehending recipient' (Steinitz 1995 p200). This 'information model' is useful in the forming or fabrication of user-friendly landscapes and, as such, has its place. But my experimental model tries to make it possible for landscape design, through the unfettered exploration of new spaces of discovery, to renew both landscape architecture and (in particular) the landscapes of cities.

A number of presentations at the Australasian Educators in Landscape Architecture 2000 Conference investigated issues similar to those I am discussing here. Clearly, the winds of change are blowing through Schools of Landscape Architecture in the Australasian region. However, entries into national and international (especially IFLA-promoted) student design competitions continue to attest to the prevalence of design criteria such as functionality, predictability and repeatability, and give the impression that many conventions of landscape design theory and process remain unchallenged. The designs are sound, sustainable, technically proficient and often beautifully integrated. They are also more often than not conventionally picturesque, derivative, grimly worthy, and fatefully restricted to the known. Most attempt somehow to transfer signification from the mental realm to that of the purely visual, to 'picture' theory or to 'figure' pre-existing subjects (examples of 'conventions'). I want to review the possibility that fascinating new subjects for landscape architecture might be brought into being by design; might be identical with it. In doing so, I explicitly question the wisdom of separating design studio from consultancy along the lines of a purported theory-practice division, and implicitly argue for the elimination of a design vocabulary that supports that division.

An exploratory landscape architectural design will put the emphasis on process rather than on product, on discovery rather than justification.¹⁶ If the product is already defined, then the process will not be free. Many recent thinkers (for example, Michel Serres and Deleuze and Guattari¹⁷) stress that humans have to unlearn the object-oriented chopping up of the world into discrete visual or physical parcels in order to comprehend the continuous forces and flows that inform natural and cultural systems. Moreover, we have to learn how to work with these forces and flows. In doing so we may discover (*pace* Deleuze and Guattari) that, ultimately, the divisive categories of nature and culture, theory and practice, real and artificial are irrelevant. Likewise, a discovery-based model of design research will emphasise the stochastic and unpredictable nature of a landscape design which proceeds by opening out to the multiplicities inherent both in site and thought.

¹⁶ It is precisely because the product stays around rather than the process that process gets devalued.

¹⁷ See Serres' *Hermes* and *The Parasite* and his collaboration with Bruno Latour, *Conversations on Science and Time*. For Deleuze and Guattari see their *A Thousand Plateaus*.

My example is from a 4th year studio at UNITEC¹⁸. This studio took the form of an examination of random or uncoordinated development in Auckland's central city. It is actually a counter-response to the wide call for an urban design masterplan for that city's CBD and waterfront. Instead of classical techniques of analysis, synthesis and reasoned appraisal, the studio used a stochastic¹⁹ or aleatory²⁰ approach to the selection and design of specific sites. Site design was not required to refer to context or to other sites (or anything at all), but if and where it did, such references were to be non-hierarchical, non-unifying, non-totalising (ie anti-masterplan). It was hoped that by using a stochastic design process that the predetermined specification of form (according to normative urban landscape design principles) could be avoided.

For such an approach, new practical and theoretical operators must be found, and new operations developed. One such operator is represented by the figure of the parasite,²¹ and the operation can be called *interference*. This became the theme of the studio project, as follows.

Within any system an ordering principle is at work. This principle selects, modifies, adapts and organises according to certain sets of determining factors. Interruptions, interferences, 'glitches,' etc are dealt with according to the rationale that constitutes the system. The urban landscape has often been represented as a system, ordered by instrumental hierarchies to do with the reticulation of traffic, information, capital etc. Traditional urban design methodology also has the properties of a system, based on the model of linear progression, of movement from analysis to design 'solution.' It therefore has its own hierarchy of dos and don'ts, of valid and invalid moves.²² When interference is encountered (a perturbation, some 'turbulence,' to use Serres' vocabulary) the system integrates it (rather than relocates, deletes or disguises it) and thereby passes from a simple to a more complex stage. Thus the interference (the 'parasite') constitutes the condition of possibility of the system's development. By way of disorder it produces a more complex order. The parasite invents something new – it expresses a logic that was irrational until now. Thus turbulence from 'outside' the system prevents the system from implosion, from weakening or decline. Such interference, however, can also come from 'inside' the system, from conditions intrinsic to the system itself, an internal 'chaos.' Perhaps this is the more interesting event for landscape architecture.

These perturbations that act on an orderly system offer unpredictable possibilities for the system. This could be one way, for instance, that the city is opened up to poetry and art. Perhaps the very viability

¹⁸ Some of the following sections have previously appeared in Kerb 8

¹⁹ Concise Oxford English Dictionary: governed by the laws of probability

²⁰ Concise Oxford English Dictionary: depending on the throw of dice or on chance; involving random choice

²¹ This studio is based on the work of Michel Serres and in particular his book *The Parasite*.

²² See Moughton et al (1999) *Urban Design: Method and Techniques* for an example of this approach.

and vitality of the city is dependent on the degree to which it is open to its poetic other. The urban system develops and transforms if it receives a transfusion of something out of the blue, something unpredictable and miraculous. The poetic impulse is its lifeblood, not its nemesis. Poetry is always open to the unexpected and always prepared to make unexpected links between places and things.²³ Chaos makes order possible.

Students were not required to design a this, a that or another thing. No predetermined outcomes, no typologies, no talk of 'urban park,' plaza,' or even 'landscape intervention'. First students selected their sites by throwing a dart at a map of the central business district of Auckland city. Wherever the dart landed was their site. They then had to map the site, adapting a technique from Corner ('The Agency of Mapping,' 1999).²⁴ Once a site plan had been derived they selected randomly (out of a hat) an operational technique (such as layering, folding, burning, erasure, extension, transposition) and performed this operation on the site plan.²⁵ Thus began a sequence of iterations. Each new carefully drawn up version of the plan was operated on again and again. Iteration was used because it generates a kind of immanent morphogenesis, a self-similar but non-identical repetition which effects a movement from the known to the unknown. As Rowbotham explains: the iteration is a 'slow transformation in small jumps' which 'drifts' from 'familiar formal territory to the unfamiliar ground of dissimilar invention by means of a series of linked steps.' (Rowbotham 1999).

Into this controlled but stochastic process which, although each new iteration is a surprise, is actually quite an orderly system of modulated change, interference presents itself as a malfunction, an error. Normally the emergence of a parasite elicits a strategy of exclusion. Epistemologically the ordering system appears as primary, and the parasite an unhappy addition that it would be best to expel. But Serres argues that the parasite is actually an integral part of the system. 'Parasite' in French means (among other things) noise or static, and Serres considers 'noise' to be essential to communication - it is the chaos from which order emerges. By experiencing a perturbation and subsequently integrating it , the system passes (or so Serres argues) from a simple to a more complex stage. Thus the parasite ultimately constitutes the possibility of the system.

Student designs

²³ This paragraph is an adaptation from Serres, who discusses science as the other of poetry and argues that science and poetry are actually different ways of doing similar things, ie creating knowledge.

²⁴ Other mapping techniques may have been just as effective, but Corner's method renders visible the field conditions operating on the site. It visualises both physical attributes and hidden processes and the interactions between them. Importantly, it enables the distinction between the 'real' and representation to become unimportant, even meaningless.

²⁵ This was not a conventional site plan as it included visible and invisible processes, sketches, photographs of site information and a wide range of site-derived material not normally associated with the term 'site plan.'

Glenice Anderson's dart landed on a multi-storey carpark. By means of the iterative process, using the operator of transposition, this nondescript building metamorphosed into a sublime landscape. The parasite emerged in the form of an ambiguity as to figure and ground (Fig.1). After several iterations she became unable to distinguish object and field. Eventually she found that the either/or categorisation of figure and ground so commonplace in urban design and architectural discourse was no longer applicable. The resulting drawing showed an urban landscape in which both figure and ground were co-present. The parasite moved the representational order from an operation that reduces the multiplicities of the lived world to hierarchical categories, to one in which landscape is no longer presented as a receptive backdrop for the objects of architecture but instead a turbulent field in which perceiving participates in the construction of reality.

Melanie Burleigh's operation was erasure. Her dart fell on Auckland's disused railway yards. But rather than operate directly on the site plan she chose to erase from Auckland City's District Plan certain words (randomly selected of course) which referred to commercial building height restrictions and property boundaries. Turning to the site plan and graphically recording the consequences of this erasure of controls, she found that the site was immediately invaded by structures, forms and spatial orders from 'outside' (Fig 2). Each iteration took her farther from equilibrium until, quite suddenly, a new order appeared and the marginalised landscape of the old railway site revealed its potential as an extraordinary urban park. This piece really demonstrated what can happen when the process of drawing becomes automatic. Rather than starting with an idea, the ideas were brought forth by the process itself.

Louise Beaumont and Corene Higgins mapped their site (a petroleum tank 'farm') exhaustively, recording road signs, boundary markers and vehicle types as well as topographical features and spatial form. For the operation they subjected their carefully delineated and photo-accurate drawings to deformation by spraying a formula on them which caused them to melt and dissolve unpredictably. The iterative procedure was 'perturbed' by a bizarre version of the traditional functional diagram which enabled the process to evolve into a punning and ironic subversion of this analytical convention (Fig.3).

Susannah Kitching's dart landed on an intersection in Queen St, Auckland city's main retail and commercial street. Susannah mapped (among other things) pedestrian pathways across the busy intersection, the texts of advertising signs and billboards and the names of buildings. She performed two operations on her data. The first involved extending pedestrian lines of force through built structure, and the second permitted scrambled texts to fill the spaces created by the first operation (Fig.4). Turbulence occurred when Susannah had to 'import' ideas from outside the iterative programme (a

reading of Lefebvre²⁶). This enabled her to move from a textual to a spatial milieu. And then, by combining the cultural coding of the various social languages she had mapped (advertising, naming, describing) with the physical qualities of the spaces her iterative procedures carved out from the building stock of the street, she discovered how space itself can become a generative component of social life in the city (as elsewhere). The whole process helped us realise how important social space is to the structure and development of the city and those who live in it.

The design process described above is an experiment in what I call nonlinear landscape design. Urban systems are examples of nonlinear dynamical systems (just as are ecosystems and other natural systems). Dynamical systems theory is not a theory of physical phenomena, but a mathematical theory that is applied to a wide range of phenomena. It is a mathematics of relationships and patterns, qualitative rather than quantitative. Thinking shifts from objects to relations, from quantity to quality, from substance to pattern.

The Nobel prize-winning chemist Ilya Prigogine studied systems under conditions of non-equilibrium. In the 1960s he realised that systems far from equilibrium must be described by nonlinear equations. He discovered that as a system moves further away from equilibrium (eg uniform temperature throughout a liquid which changes from conduction to convection) it reaches a point of critical instability, at which a new pattern emerges. This is self-organisation, which has become an important feature of nonlinear dynamical theory. Open systems (such as cities and rainforest trees) require a constant flow of energy and matter through the system for self-organisation to take place. The emergence of new structures and new forms of behaviour only occurs when the system is far from equilibrium. Self organisation is therefore 'the spontaneous emergence of new structures and new forms of behaviour in open systems far from equilibrium, characterised by internal feedback loops and described mathematically by nonlinear equations' (Prigogine and Stengers 1984 p88).

Classical thermodynamics had led to the concept of 'equilibrium structures' such as crystals. Prigogine introduced the concept of 'dissipative structures' to emphasise the paradoxical close relation between structure and order on the one hand and dissipation on the other. In classical thermodynamics the dissipation of energy was always regarded as waste. Prigogine changed this view by showing that in open systems dissipation becomes a source of order.

Essentially my experiment proposes that if natural systems are nonlinear open systems, and cities are nonlinear open systems, then landscape design (which deals with both) might reveal interesting aspects of these systems if it too is open, nonlinear and dissipative.

²⁶ Lefebvre's *The Production of Space* (1991) had been discussed in a parallel course.

With regard to the subject of this paper the issues raised by a nonlinear approach to design are twofold:

- 1) The problem for the UNITEC Landscape Unit is how to import such a free brief into the consultancy scenario.
- 2) The issue for design studio teachers is how to situate this kind of brief within the framework of the refereed studio.

Although these are *our* problems, they do dramatise the practical difficulties associated with a nonlinear approach to landscape design. The establishment of the UNITEC Landscape Unit enables senior landscape architecture students to explore these issues in concert with staff. Importantly, however, the most significant impact this model makes is on the spurious and unhelpful distinction in the minds of students, staff and public between an ideational world of theory and an operational, quotidian 'out there.'

This brief article sketches an argument for a model of research that integrates research with teaching and consultancy. It acknowledges the importance of the refereed studio and suggests that instead of relying solely on deterministic models for validation the refereed studio could adopt from scientific enquiry the distinction between the context of discovery and the context of justification. This paves the way for a more open-ended approach to the design of studio, in which validation occurs within the context of the peer critique.

The idea that landscape design theory needs to be tested in the 'real world' begs the question as to what kind of criteria must be fulfilled. Can design be truly exploratory *and* 'practical,' 'robust,' 'relevant?'

²⁷ There has been a plethora of letters in American magazine *Landscape Architecture* calling for less 'art' and 'theory' and more 'user-oriented' work.²⁸ In my experience user-oriented work is based on the satisfaction of a set of user-generated criteria (more seats, more shade, more colour etc) which, while

²⁷ The judges' comments from a recent student competition demonstrate a typical confusion of the context of discovery and context of justification, asking for instance for 'graphics with emphasis on perspectives and axonometrics' and cautioning students to 'avoid graphics that are too abstract in appearance.'

²⁸ The following are quotations from letters to the editor'

'Let us not get caught up in the avant garde and lose sight of what has worked for centuries' (*Landscape Architecture* 4/2000)

'...let's have less of this airy-fairy stuff in LAM, and more articles directed to the user experience...'
(*Landscape Architecture* 8/1999).

'Arts for arts sake is wonderful. However, unusable and inaccessible art that disrespects the public and public spaces is not' (*Landscape Architecture* 10/1999).

'...our public open space is a common resource that is far too precious to be given over to the "look at me" school of design' (*Landscape Architecture* 10/1999).

'The goal of a professional education should be teaching students useful skills,' as opposed to 'liberal arts' and 'political correctness' (*Landscape Architecture* 8/1999).

completely valid as performance criteria, tend to overshadow other ways of investigating the site. In the interests of research that discovers rather than repeats, this paper reverses that call.

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