University of Adelaide

A CONTINGENT SENSE OF GRAMMAR

Volume II

APPENDICES

Volume II of a dissertation submitted to

the Faculty of Architecture and Urban Design

in candidacy for the degree of

Doctor of Philosophy

by

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Adelaide, South Australia

November 1997

Contents

Appendices

These Appendices contain personal interview transcripts (Appendix A), and refereed papers written during the candidature for this research. Some of these papers are quite directly related to the core area of research, (Appendices B and C) while the earlier papers (Appendices D and E) explore related fields of interest that were informed by the core area of research.

Volume II Appendix A contains twenty seven transcripts of video and audio taped interviews with artists, architects, designers and theorists recorded on an overseas tour during 27 July-3 August 1996 and an interstate trip to Sydney in October 1996. Interviews also were recorded with Dr Paul Margerison (audio visual) and Richard Wentworth (mail).

Bill Barminski: Interview with Dean Bruton

Robert Berman Gallery, Los Angeles

3 July 1996

Bill Barminski is an artist that uses both traditional and new media. He lives and works in Los Angeles, USA. He works with enamel paint on canvas and has collaborated with producer and director Webster Lewin and codesigner and technical director, Jerry Hesketh on CD-ROM and internet productions. In 1996 his internet site has won awards from Microsoft.

You are an artist exhibiting at the Robert Berman Gallery, Los Angeles and also on the Internet. Would you say that there are regular patterns or rules or guidelines that you might use that you could articulate or discuss?

In my work there is a definite repetition of a certain sloganeering. For me its emphasising what I see in commercial advertising, like the base message is "consume" so that word appears a lot. There are different arrangements of the word "consume" and it is broken up to become "con" or "sume". You have the word being fractured with other words printed on top of it which actually give more of a verbal play. People like to look at it and try to figure out words that weren't there essentially, but they find them. Most of the text I use are essentially slogans or anti slogans. They are really the antithesis of whatever the commercial message is,—like the one that I enjoy using a lot, which is "Enjoy H bomb". I drop the "b" off the word bomb, because it sort of mimics advertising—they get rid of the superfluous in a certain way, so "Enjoy H Bom" is like they enjoy Coca Cola.

Is it a kind if iconographic game?

Yes, I repeat my iconographic consumer image themes, thing like the Coke bottle or consumable items like hamburgers, ice cream cones etc which in a way are like languages themselves,—or put any item you like any oval or emblem and it conveys—a meaning. Its like when you put any object that looks like a logo then it becomes a logo. So there's also that play between the language and symbols. These symbols, like convey sometimes more than you think. They are more powerful than what you are writing.

I have in the show right now the Shell logo, it doesn't say "Shell" on it anywhere, but it does say "Hell". People walk up to it and think it says "Drink Shell". But it doesn't there is no "S" there. They just look at the logo without even reading it because it's so embedded in the vocabulary.

There is the logo type emphasis; there's a typography type of play—Are there any other rules or guidelines that you could

recognise that you could use or employ in your grammar?

One of the things I do like also with the typography I have and overt text and a sub text which sub text is place, embossed into the surface of the painting with plaster. Then there is an over text and I usually try to make those juxtaposed to each other, as a dynamic tension between the sub text and the overt message. That is a sort of a rule I use. Part of the texturing is like a language or rule that I consistently use by painting modern emblems and objects and making them look really old and mucked up. For me more it is a way of connecting with the European art tradition. You go to Europe and the paintings are old and cracked up and peeling. That's part of the reason why I do that, its fun. The funniest part of painting is scratching them up.

Have you ever used computers as part of the process or do you know of artists who have used computers to develop a series of derivations involved in the art process?

Do you mean in terms of how this relates to my analogue paintings or both?

Any other work that you do—have you used a computer for it and how does that relate to these paintings?

I have been using the computer. We did a CD-ROM a few years ago, it's more like a cataloguing effort. We are working on one right now that is like an artwork unto itself that exists only in the computer realm. What's interesting about that is that a lot of the pieces that are being created in there are really derivatives of the "exquisite corpse" sort of idea—where you can create endlessly mutable sensors but where not using necessarily words we are using emblems or icons to create these like pictograms. We have been doing work that's being printed at digital prints. The actual art work is being created on the computer then output into digital printer. Actually in this show here it is the first time I actually altered an image in a computer then translated that image on to canvas.

Which painting did you do first?

Those faces in the Gallery, the twisted ones. I had been doing really warped out faces before in different ways but I did not actually use *Photoshop* to produce a weird image. This is the first time in this show. I did not do any warped faces in the early work. They weren't warped like these. They have double mouthed, sometimes anamorphic, stretched out, but I did not use the computer for that, they were just hand drawn or sometimes you just have a slide and you lay a canvas at an angle for projection.

Do you think the computer adds a dimension beyond what you had done with traditional media?

The actual work that I am doing on the computer—yes, I am able to create—well to me it's like a whole new life form its a combination

of all these other art forms but is has all this interactivity on top of it which to me is really exciting because it's something I would never be able to do in a painting or song or book or video but I can combine all those elements and make them navigable to the user. I know I am creating something that doesn't exist anywhere else except being mediated through the computer.

Do you see the computer work as taking over from traditional media or will they carry on together?

They will carry on together, to me personally I am not going to stop painting and I am also going to do this other thing, its like television didn't end cinema. I've been giving lectures and going to conferences and stuff talking about new digital art as a new medium and its just like there is some misconception about what it can do and what people are expecting in order of interactivity. People are bringing so many agendas to it I have a definition for interactivity: *you click and something happens*, that's it, that's all it does. There's other people that think its going to save the inner city, teach people who are uncreative to be creative and so on.

Do you think that the difference between design and art?

I suppose,—I guess there is a difference but—where does something stop being design and becoming art? It gets to the question of what is art? It is hard to say I know lots of designers who what they are designing is art and I know designers that make something that is really not art.

Would you agree with the statement that "Design is computation"?

What is computation?

Computation as a binary rule-based—a yes-no approach. In other words, does design have definable rules?

Yes, its like its really similar to Haiku. There's like a rule, several can only operate within a frame, like design is, especially for interactivity or computer based art, there is a really strict framework you have to operate in. You can only do so many things. I think the best ones are the one that get to the edge of what you can do and take it and turn it upside down and do what you could not do with it before. I just know because I have been learning how to program,—its like those constrictions spur your creativity: How can I make something look cool using just these three tools or three pieces of code?

Is that your starting point for a piece what is your starting point?

Let me tell you the process for the one I am working on now. I did not know how to program. Its like, "Lets make a single navigable hallway that you can walk down to the end of and look at something", and that was my starting point. A really basic thing to learn

how to do and direct it—click, click—play a movie. After that, lets walk down a hall and put doors there and put more stuff in. Open the door and go in,—from that process lets make more rooms and each room has to contain a new programming challenge or new content challenge, or interactivity challenge or combination of all those three. If you look at the rooms we designed they start very simply.

The things we are looking at now are pretty complex. If I am not constantly working on them I can go in a month later and I am scratching my head and saying "How does this work? Where's all this stuff go? What's all this for?", —then it takes you a minute to get back to using it.

What would you say the role of the artist is today in general terms in society? What do they do?

Bullshit!! [laughs] I used to think that there was completely no role for artists and after being one at the time. I make my living from it. We really serve no useful function because I think at a certain point artists think they can change the world. I think in the abstract movement said we are going to paint nothing now. I used to just think well I really don't have a useful function in the sense that I don't contribute to society.

Now I feel differently I don't apply it to myself, but I do think that most progressive ideas really start as some sort of art form, whether it being painting or idea for literature, its these things that eventually become some bright an idea expressed as some kind of art form.

I think that that is the role for artist now. Maybe they can present ideas. They don't have the power to shape those ideas in society but they can present them to society and society can decide whether or not to engage with them.

Would you say artists create identity and culture?

I actually think what is happening now is that advertisers create identity and culture. More and more advertising and television is becoming the cultural dialogue. I have more discussions with people about the recent *Coca Cola* ad campaign than the recent art exhibition at a gallery. Those are people who are involved in the arts,—if you know like regular people their cultural dialogue is shaped by the corporate identity that's where their culture is being dictated.

Thankyou.

Larry Becker: Interview by Dean Bruton

Becker Gallery, Philadelphia

23 July 1996

Larry Becker is a contemporary art dealer and Director of the Larry Becker Gallery, Philadelphia. His gallery shows artists that use conceptual systems, as in the work of Bill Walton, Tom Chimes and David Wickland. A brief excerpt from my visit was recorded.

[Looking at images of an exhibition of Bill Walton at Larry Becker Gallery, 1996]

Here's a Bill Walton show. One of Bill Walton's shows. There is a Bill Walton piece, David Girk, you want more shots. Here's the Tom Chimes' goldfish and Bill Walton show.

[Looking at a painting in the Gallery]

His name is David Wickland and he's using traditional materials, this is stretched linen over a traditional stretch prepared in the traditional way. And he is using oil paint but the way he's using the paint or whatever material he uses has to do with a sort of meditational walking across the surface. I think this one he probably painted for his show—and it looks like a very quick piece, a very graphic piece maybe almost a decorative piece at first but then you realise that he very slowly took a point of the brush that was loaded with paint and just slowly went step by step over the surface of this canvas.

He talks about having to ignore the layer that's under the first layer when he is doing the second layer he has to ignore what he is going over because it would predetermine where he was supposed to put the things. He is trying to keep a sense of—not using—a logical grid. He's using a logical method but not using a logical grid to make marks on the canvas.

There are others in which you can see that it almost looks like a regular pattern of dots, and people are always looking at them saying "Isn't that an image of something?"—and it's not. It's just when the dots and the different layers go in and out of the picture plane they overlap and they don't overlap.

What is the title?

Actually the first one behind there is called "Stationery warplands" and this one is called "Application of the sun".

Scott Chase: Interview by Dean Bruton

National Institute of Standards & Technology, Washington DC

23 July 1996

Scott Chase when interviewed was a postdoctoral fellow at the National Institute of Standards and Technology, Washington DC. In 1998 he joined the staff of the Key Centre for Design, University of Sydney.

What are your current interests at this institution?

I am a postdoctorate here at the National Institute of Standards and Technology outside of Washington DC. We are a government institution that basically access consultants to United States industry and this is a manufacturing laboratory. We deal with aiding US companies in their manufacturing issues. I actually am trained as a architect. All of my degrees are in architecture. My area of research has to do with shape grammars and the representations used in them. I am interested in generating designs using not necessarily grammars but productions systems which can be like grammars.

Do you see reflective practice as part of the process of developing innovative design in the work that you do?

I am not too familiar with Schön's work. I am not sure how much reflection comes into the work I do. I really am interested in production systems.

Could you describe that more clearly, and also the process you do use to develop results that you might find significant?

OK, It really has to with automation and actually I should back up a minute and say that I am interested in analysis of designs, finding, (and what is known at least in computing science and manufacturing) as feature recognition. It is finding all sorts of properties of designs, certain things that you might be looking for. So I think of it as analysis. Once you have done a design, finding out the interesting things or things you need to find out or verify about a design.

Getting back to reflective practice—as a designer, and I really should say I haven't done design in a number of years. I think it is an important thing to do. I am not sure how that relates to grammatical work in terms of using a grammar to generate designs. I think the use of a grammar more as a generate and test. You produce a design, you look at it, reflect on it and then possibly generate another design. Or if your grammar is set up to where it is in stages. You run your grammar, you generate something, and then you look at it and then you can either back-track and generate something else or continue along the same path to further refine the design.

Your works analyse "a " design and looks for features and elements in "a " design. Could you explain?

It's basically parsing rather than generating, using a grammar or some similar mechanism to parse a design and to figure out what the structure is or what the features of the design are. Parsing means the reverse of generating element in the language, but using a grammar to find the structure of your element in the language whether it be a sentence or a design based upon the elements of the grammar.

So how would you go about your analysis?

I tend to bill my work as feature recognition, which to me is sort of the same thing. As I said, that is the term that is used in computer science and manufacturing. In that case what they are doing is looking at a solid CAD model and trying to identify features of interest: in manufacturing these tend to be operations,—features related to operations so you can figure out how you can actually manufacture the part.

[Holds up and demonstrates with mechanical part]

Talking about manufacturing features,—if we have a part such as this that we want to manufacture, the types of features that we are interested in things like holes, and shoulders and, this is a slot. So that you can apply operations such as drilling, boring, grinding, milling, things like that. Here we are dealing with numerical control and robots to manufacture these things. The idea is that you write a computer program which can identify the types of features in the part, the holes, the slots and figure out what types of operations can be used to manufacture the part.

I am interested in finding features like that in designs, not necessarily, I am in the manufacturing division now so I am interested in designing these types of features, but my work in the past has dealt with properties of designs in architecture, in geographic information systems, things like that and it has to do with the notion of emergence, emergent features.

I am interested in the contingent sense of grammar when rules appear to be used, when they change, when there seems to be a sudden change in a derivation. How much rules appear to carry over from work to another? Can you comment on a contingent sense of grammar and does it seem to be part of what you understand is the feature basis of analysis of design?

I am not 100% sure of what you mean by contingency. I get the feeling that you apply these rules when they might be appropriate.

There are two concepts. One is that there is something additional to the grammatical and the other one is that there is something contextual that is involved in the creation of the grammatical. The contingent sense is added through the understanding of grammars and the grammatical metaphor. Could you com-

ment on the grammatical aspects of what you do with manufacturing products?

In terms of manufacturing it is quite difficult to put your finger on. I am very new to the manufacture domain and I am just trying to figure these things out and even if the work I do even applies to manufacturing.

In terms of "contingency" with grammars—as a formalist I would like to say that grammars if you write a particular grammar it should be able to generate whatever you want. That you can use a grammar and just generate the class of designs that you want. Practically speaking it is very difficult to do. You can use grammars in portions of your work but that other things may come into play. I don't know exactly what those are. I have not made a study of them but I know that people and design theory who deal with cognitive issues that their big thing.

How do you see the place of grammars in making new designs?

I think that I would love to see more of it. I don't think there is a lot of that kind of thing going on right now. Mainly because,—well it depends on what type of designs you are talking about. If you are dealing with designs which don't have necessarily a lot of practical constraints put upon them such as in art, I would like to think, that there is a huge potential for using grammars to generate designs.

In other fields such as architecture or manufacturing, the functional constraints put upon the designs make it very difficult to use a grammar to fully generate a design,—maybe for portions of designs. I know there has been some work done. The only work that I am really aware of is the work of Terry Knight's students who use grammars to generate new designs. I don't know how much they deal with the practical aspects of the designs. Then there is some work at Boeing by Geoff Heisenman who took his PhD work on solid grammars and has expanded that, dealing with some generative design projects for aircraft manufacturing. But that is only a small part of the whole process.

Would you say that there is two aspects to grammars, the loose analogy; the metaphor of grammatical design as a loose analogy, and there is another aspect that really is formless and that the two are separate. Would you say that there is a kind of continuum and that perhaps an artist that has a vague idea of systems or series is still working in some kind of grammatical way as a loose analogy?

When you are talking about "loose" systems, I am not sure what exactly that means. Maybe nobody does. I should back up and say that in terms of formal generative systems, I don't necessarily subscribe wholly to grammars. There is a paper that Stiny and Gips wrote in 1980 that I like to follow. It has to do with productions sys-

tems and grammars, a uniform characterisation. They basically made a chart comparing different types of production systems, grammars, shape grammars, post production systems, phrase structure grammars, all different types of formal systems and the different parts, the interpretive mechanism, the elements how rules are used—that is a very nice comparison. I would like to take a look at such systems like this and not wholly subscribe to the notion of a grammar as the way to generate designs.

Do you think that new designs can be developed through formal systems? You mentioned the work at Boeing. Would you say working with very formal grammars generates innovation or is it not as simple as that?

I don't know what kind of success that they have had in Boeing. I would like to believe that the potential exists to generative innovative designs using grammars, because you don't always know what sorts of things are going to emerge in your process.

Have you got some examples that you can show us with your own work that is generated anything new through formal systems?

I don't have any concrete examples. I can talk a bit about emergent features which is one of the strong points of the representations used in shape grammars. That is what I am interested in and where I think a lot of people miss the boat when they talk about shape grammars. They don't really understand what make these distinct from other type of grammars is a notion of emergent features. I can show an example here.

[demonstrates to camera on computer screen]

This has to do with representations that is known as the maximal line representation that is used in shape grammars. Trying to find that element, within this shape, there are a number of different possibilities using Euclidean transformations of scaling and rotation, mapping this on to this. This example here shows that there are twenty two different ways that this can be mapped onto this. That is by finding portions where you can identify any portion of a line. I call these emergent features.

Most CAD systems can't do this. Where once your have drawn the line you are stuck with that and you are not able to recognise any portions of it. So this is a very powerful notion. I am not sure if I am explaining this enough, but the people who work with pure shape grammars, this is a strong point which is emphasised as well as how this is better than more traditional CAD and graphic systems. I have to say that the problem with this type of representation is the computational problems are enormous. Mark Tapia has dealt with these problems and a way of simplifying these representations and the grammars to deal with restricting the set of possible designs which

might be generated from a derivation in such a grammar. These types of representations are really what I focus on in my work which is these emergent features and using formal logic to represent shapes and spatial relations, as I see them, for these types of emergent features.

What is the outcome of this work?

The outcome is that I hope to make computer systems to take this, as I have specified these types of relations, using formal logic, to take that and translate that into computer implementations. Formal logic is I think, one step removed from computer programming using logic programming systems. Once we have been able to code these things I can then use this for feature or pattern recognition types of software, identifying these types of emergent features.

Could you see the same thing applying to an artwork, say a Jackson Pollock or a Mark Rothko painting?

Certainly. Absolutely, finding emergent features, depending what you are looking for. I have practical examples of the types of emergent features that I am looking for in my work. I can show you some examples of that.

[demonstrates on computer screen]

Types of examples where I recognise emergent features, are, this is dealing with geographic information systems. The example here is what I call an accessibility relation, where on the top figure here.

[points to screen]

you are actually trying to find out whether Regions A and Regions B, and maybe plots of land, are accessible to each other by roads and simply by drawing these things I can find that they are connected. More traditional systems have to develop the explicit kind of activity graphs and I can simply draw these things and find these, what I call this as an emergent feature,—if you have got the right kind of computational tools you can recognise things like that.

[shows diagram]

Another example in architecture, given a floor plan that looks like this, to go through some computations and be able to recognise these types of emergent features which I call views based on the maximal element representations of shape grammars. When we are dealing with view here, I call a general view between spaces, an axial view, this is an enfilade symmetric view. The representations I use allow these types of feature recognition which is not necessarily done with a grammar, could be, but I am not looking a formal shape grammars per se to do these types of things.

Are there criticisms of grammars or is there is a particular use of grammars that need to be articulated?

I can't point my finger at particular critics. The problem is that it is very difficult to develop grammars that do exactly what you want. That's the trick, that is where all the work is. Certainly with shape grammars, the computational aspects are so enormous the computational problems,—because you can't sit down and easily write a computer program to do what you want people just kind of dismiss it. I think that is probably the biggest criticism, or they don't necessarily understand the deep issues involved with grammars. Getting back to a comment that you made I believe came from Thomas Seebohm about the Palladian grammars, and I am paraphrasing what you heard from him. That this Palladian grammar that Stiny and Mitchell developed isn't good because it generates this type of plan that didn't exist in the Palladian corpus of designs. The one with the room that goes all the way with the width of the building?

Yes.

All you have to do is modify your grammar. If you don't want to generate designs with the room going all the way through the building then you modify the grammar to not allow such designs to be developed. I believe that Stiny and Mitchell wrote at least one paper after their initial paper, dealing with issues like this, saying, "Well these types of plans did not exist in the Palladian corpus of designs and therefore you need to change the grammar." I think they address that issue in future papers. I would say that potentially you can, if you work hard enough at it, you can use grammars to generate exactly what you want, but it can be a lot work, depending on how sophisticated your designs are.

A major criticism that I have heard is that the results of grammatical derivations are not anywhere near detailed enough, that they are too far from the mark of the initial work of the artists, that they were attempting to derive new versions of. Is there some doubt about that with some of the work done on artists anyway? Can you comment on that?

That's a bit of a stretch for me at least. I agree the grammars that have been developed which analyse designs—I would hope that they capture the designs, but I don't think the design process used. I don't think that is a point of them either. It could, like you said, it could potentially capture the design process.

When is it useful to use formal grammars?

I find them useful for generation. Since most of the work in the shape grammar milieu has been used for analysis, they can be useful tools, but the problem is how much of a style are you trying to capture? Are you just trying to capture all of the body of work of a particular artist and nothing else? Are you trying to capture something larger, something smaller? That can be very tricky. I don't think unless we really work with some living practitioner that we are real-

ly going to capture their process unless they really made some kind of effort at notating how they went about doing it. Most of them, I don't think did.

Do you ever use computers as a medium for graphics design, If so, what was your experience as a medium with computers involving derivation of rules?

I haven't really used computers to work with grammars for derivations. I really don't know of practical grammatical systems that are computer implementations. My work has basically been manual. I did do as a Masters Thesis about ten years or so ago, published in 1989, write a PROLOG program which was proof of concept of implementations of shape grammars on computers. It was a simple grammar system, a very small one that used the representations like this, [points to example on computer scree] the maximum line representation, and it was a simple grammar system where the user had to actually control the grammar, specify how to apply the rules, but could generate size, and that was really a proof of concept. That is the only use of computers I have used with grammars. All my other graphics work has been in drawing, or general design work using CAD systems and it has been a number of years since I have done work like that.

Who do you regard as particularly grammatical?

I wont go into the architects and artists who have been documented in the grammars literature. I think you are probably aware of all that.

It is interesting because there is one architect who I think is exhibiting now at the Octogon in Washington, who is Bruce Gogh. He was an architect who actually worked for Wright for a short time. He died in 1982. He was based in Okalahoma and his work was very far out, very sculptural, very strange and difficult to build. The work is mostly residential work in Okalahoma.

Each design looks completely different from the other, there seems no rhyme nor reason to his work, but if you analyse it, and I did an analysis in a design class nine years ago,—a spatial analysis that is all that it was,—he dealt with different geometries and he dealt with different types of typologies. In his floor plans I discovered he used three or four different types of geometries, he used circular geometries, he used rectangular geometries, he used "crystalline " geometries such as hexagon "packing " shapes, and then some that didn't really fit into any of these nice geometric categories. He used these in different ways. He also used the typologies, I looked at his designs and saw three or four different patterns of typology. I saw houses which were built along a linear pattern, houses which were radial in design, houses which were concentric designs, where things were built out from the centre, he also had a spiral design too which is actually a form of linear.

I discovered maybe three different topology and floor plans. Those typologies were not related to the geometries. So you would find these linear patterns in spiral designs, you would find them in straight linear and then you would find them in curved geometries. Similarly, with radial designs and other types of typologies. So I think he was using some kind of rule systems to do his designs, but most people who look at them do not see this.

That is something that I think would be very interesting for somebody to explore. To see whether there is some sort of grammatical, to see where the grammars can be used to generate, I won't say Gogh like designs, but the underlying typologies used in his designs.

Are there any artists that come to mind, say two or three, that you might name, that are particularly grammatical, whose work that you think could be tackled from the grammarians point of view?

I don't follow the art world that much. I would think that this type of work is going to be all abstract. I cannot really think of anybody.

But is it conceivable that a figurative painter could be understood as grammatical or use a series of different grammars?

Any designer be they artist or architect is using some kind of rules in their design. I would say yes, there are probably grammars that they use, some sort of rule sets, I will call them, that they use when they are doing a painting, whatever. Certainly there is a representation style. So there would be Cubism, that type of notion, or Pointillism. That is a representation, the low level of representation I think there are certainly rules that can be applied on how they compose their pictures, The Renaissance painters had ways of composing pictures, of laying out where people would stand and things like that I would definitely say that would be worth looking at.

So you would understand paintings in terms of spatial relationships on a two dimensional plane or a spatial relationships on a three dimensional plane or form?

Yes.

That would be what you would make the grammar, the rule?

Yes, that is the first thing that pops to mind. I haven't really thought about this issue. I am sure there are other things you could look at.

Do you think you could look at conceptual art in a grammatical way? Say the work of an artist that just deals with words like Barbara Kruger and her billboards or an artist that deals with nebulous things like casting negative space?

I am not aware of their work. If they are dealing with something like words, you have already got some kind of token there to begin to deal with how you are going to layout, or how you are going to compose your designs. Certainly there is potential for something like

that. Going back to artists, I think certainly the abstract expressionists and before that there is potential. I saw work at the LA County museum last year, on Kandinsky, I think they only had twelve of his paintings from a series and I can certainly see a lot of similarities and a progression in his style as he develops his work. I can certainly see that there is potential for developing grammars from his work.

Would you agree with the statement that "Design is computation"?

That depends what you mean by design, that depends what you mean by computation. I would like to think of everything that we do is computation, that there is something going on in our brains. I tend to subscribe to that belief. I like to deal with design in this formal generative sense. As we were talking at the beginning of our talk I think there maybe some other things involved which most people would not call computation—dealing with some of these cognitive issues. I think those are important things to look at too. Ideally I would like to see, design to be, this pure computation generative thing, I don't think is possible in our lifetime.

How do you distinguish art from design?

I think art is a subset of design. I like to think of design as all encompassing, all disciplines. Art I think tends to bring a more abstract, less functional aspect to its designs. Certainly, a very strong purpose of art is to evoke some kind of feeling in the viewer.

Can you make rules for generating feelings?

I think the psychologists would certainly say yes. Certainly there are ways to trigger certain feelings, whether they are totally successful or not is another issue!

Thankyou.

Philip Cox: Interview by Dean Bruton

Cox & Partners, Sydney

15 October 1996

Philip Cox is a major Australian architect and artist. One of his many famous architectural projects is the tourist resort at Ularu in central Australia. His regularly exhibits his paintings in Sydney.

What do you understand by the term "grammar"?

The use of the word "grammar" is a more formalistic approach to a set of expressions. I always think of "grammar" as the framework in which one works. In a formalist way, —if you take a language, a grammar provides the structure for text. It is a discipline. In literature there are nouns, verbs, phrases and when put together there is a composition. Grammar provides for that language in a structural sense.

Could you explain the relationship between your art and your architecture and comment on whether there is some rule base that might have developed over the years?

There is a similarity between various visual grammars. Painting and architecture have common philosophies in terms of is interpretation. Obviously a piece of architecture has many disciplines as opposed to painting. Painting is an expression of emotional, visual and intellectual responses to the subject matter. Architecture has many more disciplines and influences such as, political, economic and other situations which make it an extremely difficult art form in to which to participate. Architecture is conditioned by those constraints whereas painting has a greater sense of freedom. Necessarily there is an interrelationship between the two in terms of the approach that is made to the subject and the responses that are inherent in both media.

You obviously read two dimensional forms in art very differently to three dimensional forms that are created in architecture. One is looking at a different spatial sensation in architecture as opposed to painting. Painting is the illusion of space where architecture is the creation of space. You always have this counter-action between an illusion, and the reality of art and architecture.

In many ways the experimental ideas can come through painting into architecture and certainly philosophical attitudes co-relate. In both media there is a series of sequences and structuring of thought processes. The mind works in a very similar way,—it is a response from the eye to the intellect of production. Architecture draws from form. It is the same as painting at one point of time in conception but instead it is built not painted. It is a matter of looking at art and see-

ing the illusion, then being able to translate that into an architectural form which becomes the reality in a three dimensional way.

It is a different thing if you are a sculptor and creating space by reducing something or constructing something. You are actually physically "doing" it. The real difference in architecture is that you are getting other people to do the construction for you. You have builders or technically alert people translating what you have actually drawn on a piece of paper to a three dimensional reality.

So getting back to the real issue of the process, —I find that it is natural forms or the more metaphysical reactions that trigger off thought process. It is very difficult to analyse exactly what stirs and what is sequence. I remember Lloyd Rees saying that he always experienced that great mystery where he didn't know what he was doing when he was painting. He looked at the work and said, "Who has painted that?", —still holding a wet paintbrush. The spirit moves in such a strange way within the thought process. There seemed to be somebody else doing it for him and then there is a realisation,— that is coming back, and reflecting on what the process was he actually had gone through. Obviously it was a deeply moving metaphysical experience.

I find in architecture, your mind is working on a whole series of levels at any one time. At one point of time you are taking an environmental view point, that your reaction to either landscape or your reaction to an immediate environment where the work is to be located, —next you may be looking at technical aspects exploring opportunities within the materials that you select. There are the social, political, and economic factors that come into that process. I suppose that the difficulty with all this is the synthesis between various levels and how these are measured in any one time in the process. Many of those issues of course go across the mind when painting. You have still have the environmental aspects, you still have social and other issues and the overlaying of other meaning of what you are trying to express. The intensity between the two arts is different depending on what level of development they are being analysed.

Can you think of any key rules for form making that recur throughout your work as an architecture and an artist?

I am concerned about the bare bones of structure and the spatial qualities that go with those bones. I suppose I am also interested in the structure of painting and how that painting goes together in the structural sense. Obviously in architecture it is more sophisticated when you look at nature there is always structure. Whether it is a human body or a skeleton form or parts of a plant structure is significant. The structure forms its own space. If I took one single grammatical gesture it would be the structure and the compositional aspects of how that thing hangs together. The rest is embroidery, and embellishment—how do you explore within that bigger structure,

the delights of details or delights of something else? In the same way in a painting, provided that structure is overwhelming and convincing where it is the surface of paint somewhere or it is a detail within that painting that is adding to the general structural aspect of what we are doing.

Could you give an idea of the development of your rule base—where you work as an artist; when you just start painting; how did that develop as part of your work; has it always been there?

I suppose I have always painted. The curiosity has been rather the balance with architecture and art. Architecture is time consuming. In one sense it is corrupting the visual aspects of painting because I think the drawing of architecture is more scientific. In some ways it has greater meaning. When I do an architectural drawing I know that it means structurally and constructively with other issues that a layman looking at the drawing wouldn't understand. They wouldn't understand that it has its own messages and language. Painting doesn't necessarily doesn't have all those inherent or learnt applications. A paint stroke doesn't necessarily mean an RHS girder. It has no other symbols. The symbols might be emotional symbols,of implied. In an architectural pen stroke, concrete or actually a steel girder is represented, it has a clear message. So the symbols change between architecture and painting and it is easier to have emotional messages in painting rather than the intellectual ones applied in architecture. Lines actually mean structure in architecture . Two lines crossing means connection in a way new geometries are revealed. In painting there are different messages and a different set of symbols.

In your recent work and in your paintings, would there be a series of things that you were trying to communicate?

I have been concerned that as Australians in art we are overridden by reaction to the landscape. In other countries of the world, I don't think people are affected as much as by landscape as Australians. Fly over Australia, or any part of it, this continent possesses a landscape that really overwhelms you. You feel whatever you do in an artistic sense has to respond to this continent. It is such a difficult response too because it is not an easy environment to work within. It has a harsh light, it is very clear bright skies, the detail of the landscape is intriguing and complex. We only have to look at our flora and see complex Grevillia or Calistimons or Eucalypt forms that other plants probably don't even have.

When you look at the detail in nature you can see corresponding landscapes. Your emotions respond to it, and it is possible to translate these forms into painting or a building within that landscape. constantly working out that relationship of the object to the landscape forms itself; how they work and how they integrate. I think it has been a preoccupation that architects of my generation, such as the Glenn Murcutt, Darryl Jackson. By contrast Harry Seidler sees

the world from a modernist sort of viewpoint. The generation of architects which I belong to are generally environmentalists, rather than intellectuals imposing a new order on the world. The modernists obviously had that imposition view. We are concerned about the order of the world and environmental issues.

Can you think of some designers/artists/architects who use rules in their work?

Michael Johnson is a painter who very much has rules. He has consistently painted three divisions on his canvas and he has repeated that and yet every painting that he has ever done is to me a great visionary statement of landscape. Yet he very rarely departs from that grammar, of the three fields. Now those three fields can be interpreted in a metaphysical way, of sky or earth or water, or whatever it might be. It can be interpreted in the whole theory of immediate vision, or distant vision and very horizon type of attitudes. But within that he has explored in his work a whole series of interplays which I find very intriguing.

These are quite strict rules?

They are strict rules that he doesn't deviate. Perhaps he feels nervous moving out of that sense of grammar. But with architects I could take Glenn Murcutt for instance is a person who I believe works within a very strict grammar. He has taken a vernacular form, being the shed, and he has never moved out of that very simple rectilinear spatial interpretation. Whether it flows above or sits on or it has got a curve or it has got a flat or it has got a pitch or whatever. It is essentially the same building that is repeated. Now one can use that as a criticism of Murcutt's work and on the other hand one might say that is a nice exploration of a light building medium. You might try to reach a perfection within a set of rules and it's a very strong discipline from that and it is very interesting to see the variations within that, whether it's in iron or glass or material situation. How that particular form reacts to various sites, various conditions, rocky, wooden, leaky, meadow and so on. But I think that is work that succeeds in that he is very confident within a very simple or I might simplistic formula, or grammar. You can obviously see the confidence of the person in the various variations that he makes with that.

Outside of Australia?

I think Norman Foster does a similar thing but in a much more complex way. It is not just taking a singular viewpoint. It is taking a pluralist type of approach to whatever building type he may be working with. But essentially one sees an enormous discipline with his work, of which, structure, again is that overriding thing. With Foster, he doesn't allow anything but the most pure forms coming out of his work. You can always identify that it is going to be a naked building so to speak, the structure always reveals structures apparent. The

infill will be amenable to that whether he is using, trebeated form, or domical form or whatever geometry, that geometry will always be an essentially pure geometry. He is not going to be terribly complex.

But if you took a man like Frank Gehry something like that where the various philosophies of Derrida and others where complexity and the more sculptured aspects, it is very hard to actually pin people like him down and say he is working with "that", because it is such an emotional response to whatever he is doing. Then one feels that is purely a heart reaction to the problem he is doing. Therefore whimsy and irrational viewpoint is often the order of the day rather than say an intellectual response of, say that Foster might have, of always adhering to that overriding grammatical affect of his work.

I see Foster as the master of grammar where I would see in contrast to that Gehry as being purely almost like a German Expressionist where emotion is pouring out all the time. It is very interesting work, I am not knocking it in any way I am just saying that is a very different response, that he relies on emotion and after there is very little.

Lionel March talked about the rule of "contraversion", I wondered if you could see Gehry in those sorts of terms?

It is an interesting word, "contraversion". It is very hard in Gehry's work to really understand to what extent the philosophical attitude is, where it is the overriding or compelling philosophy rather than say his own artistic emotional response, or whether it is an imposed intellectualism. The real composition, and the real building is very successful in the majority of his work,and overwhelms the erratic nature of exploration taking place.

Do you use computers for your work? And if so what was the experience?

I don't use computers personally but I am not a luddite. Obviously computers are used extensively in the work that we do. I am of that generation where a paintbrush is a paintbrush and a pencil is a pencil. I find it very difficult to create anything on a computer because I am so mindful of the computer. It is bit like word processors as opposed to a typewriter I suppose, I am still at the typewriter, banging out something rather than a computer or using a pen. I find it very difficult to do anything, even when I am writing I find that I can't use a machine. I write, if I am doing a book I write it: quill and ink. The same thing with architecture that the thought process has to flow through brain to eye to hand. I find it very hard to use a media of moving a mouse around or something like that in order to see an image. I find that too frustrating, it is not immediate enough for me. I just get irritated because I am not of that generation that has used it as a pen and as future generations will use it. I am not clever enough for that and I find that the mind to the hand or whatever response is going on it has to be an immediate situation. But I admire people

who can use computers that way and I am sure that people in the future will do the majority through that medium.

Would you agree with the statement that design is computation?

When you use the word "computation", it is a word that often used very loosely to slightly "put down" design as not truly creative. Design overrides other factors when technical or other factors come into process rather than truly creative situations. If you design something rather than paint something, you know it is got an interference. In one sense, design is computation where factors are transmitted into an item. If you design something you are designing for a particular purpose. You are not designing just for a emotional response which you might do in painting. There are sets of conditions, factors in the process of synthesising all issues and giving priorities. It is interweaving those values into a product and as a result an item is formed. I think it is a very difficult and stimulating process, more stimulating perhaps than the painting or the purely emotional response.

How do you distinguish design from art?

Art does not take into account technics, design takes into account technics and other issues. Design will take into account economics for instance, politics, social factors, environmental factors where a purely artistic response does not necessarily do any of those things.

Education. I am interested in your views of the education of the architect and the artist and where rule sets and grammars might play a role.

I think that one of the most disappointing things in schools today is that the artists and architects are not working together. To educate an architect without art is a disaster and most of the schools in NSW do that. I think that the experiments that were made in the early days of the Bauhaus, where artists, architects and engineers were working all together in the studios is the healthiest way of doing that. I mean everybody might have their own particular event, but essentially were all in a creative process that needs to be stimulated by cross fertilisation of other activities. We have here a whole series of schools that are quite devoid of architects being educated in the history of art of the history of artistic development. We have people coming out of our schools which may not have even been in a gallery during their entire existence. They certainly are not conversant of the correlation between architecture and painting. They may have been familiar with Giotto or Michelanglo or some of the Renaissance people but they have seen as developing in similar streams with both architects and painters and writers and all the rest of it.

We are tending not to develop the universal man and I think we need to. I think that the one characteristic of an architect should be

that they are universal people. They are able to be worldly wise about all forms of art whether it be painting, sculpture or any of the visual arts and design of course. They are the ones that encompass the management of the environment itself as well, the landscaping and the corollaries to have artistic endeavour.

So I believe a lot of the failure in architecture with the younger generation now is as a result of their not being artistically aware. I think we are going through a bit of a dearth now. If you take my generation, we were brought up more in that artistic environment. At Sydney University in those days, we had Lloyd Rees and Roland Wakelin and people like that who were an enormous influence. They haven't artists working in their studios in the University of NSW of which I am part. There is no history of art taught and there is very little history of architecture. Now how can you produce an architect when you don't know where you have been or what steps to take into the future let alone what was the correlation between the great philosophies of the world and great artistic endeavours of the world and then trying to understand architecture and how it falls within that. Unless you have a proper grounding in that you may as well give up. You are just not trained as an architect. You are trained as a technician perhaps, but not as an architect. It is big problem.

Does it get easier as you become more experienced as an architect and an artist, — because your rule base becomes more familiar,— do you start to know more about your grammar?

I'd say yes, very much so. There is an enormous confidence that comes out of that. Having invented a type it is easier to work within that form. So that you may play with the environment that there is more playfulness within that structure, that grammar and that gives you the confidence to take the intuitive leaps that you may want to take, knowing that there is a rational process that has backed that up.

People confuse intuition and rational design approach. I I think that the rational approach to design is really merely the creation of a grammar. It is nothing else but a grammar in which people can take intuitive leaps. But to think in terms of taking the intuitive leap first is I think quite wrong. It is what Herbert Read talked about in *Icon and Idea*, in his book. What comes first, the chicken or egg first, is it an intuitive or inspirational thing or is it really the rational approach that you have a quickly assimilated thing within your grammar and then it instantly enables you to take those leaps into various areas. Getting back to education, a lot of the students today are so bewildered by not having a grammar or a rational process of design and it is taught purely on a intuitive basis, where you are meant to be inspired, to switch on the light globe every time you have a problem, they are bewildered by that. I think it is a very wrong approach to take with people that I think one should be helping them to develop

a process and a grammar from which they can launch into other creative responses.

Is there an example of your work, a painting or a piece of architecture that you could explain how you might have used the key elements of your rule set?

If I can take the architecture first,—I'd say that work done ten years ago, say Yulara would be exactly the same response that I would be taking in a building that I am designing right now. Which would be that it is response, an immediately environmental response. It is the *genus loci* view of the world that every space is special and every space is going to tell you something. It then develops through an environmental situation of how do I respond in an effective and interesting way with that situation. It then develops very quickly into that broad structural response which is how can I get a matrix working within the landscape in order to do things that I want to do with it spatially, or from the functional aspects of the problem solving. How do I weave all that into the situation, how do I advance the thinking of my time as far as I can what development can I take? Can I take from here rather than relying on a past language or whatever. It is selection of the materials that I want to use within that situation, whether it be glass, plastic, steel, timber, concrete you know starts developing in that situation. Then having done that situation it is then in the articulation of how those things are put together in a philosophical sense depending upon the parameters in the problem or the brief or whatever that is imposing itself on that.

So I am approaching say the competition that I am doing at the moment with the Singapore Exhibition Centre, a different country, a different client, culture, vastly different site that process is very similar. I wouldn't deviate from that very much, it will always come out with a different solution because those issues are universal issues not dogmatic and isolated to our particular situation. They have greater breadth to it which allows a multitude of ideas and expressions to come into that situation.

Is there a particular form making rule that you could identify?

When you say form making I am a bit bewildered by that because I don't think in terms of form at that point.

How do you get to a form might be a way of putting,— how does a form arrive, after all those considerations?

The form comes through a process of analysis. whether the form be rectilinear, linear, curved, prismatic or whatever, the form is generally generated out of those reactions. That is why there is versatility, it is not because I am always working within a rectilinear mode or I am always doing curves or something like that. One explores all sorts of geometry's and the geometry is really generated from those reactions as I have described that it is a analytical process that really

comes forward with the opportunities of form. They may be various solutions or various options that come out of a series of sketches. They might be contrary to each other, they may be discarded for various reasons.

Well, with Uluru [Yulara tourist resort, Ayers rock, NT, 1982] for example, can you think of how the form came about?

Well the form or making come virtually out of the landscape. It was the study of the sand-dunes and the actual geography of the place and the form of wind were made with these incredible sand-dunes which are not apparent within them. It is only when you get above them you see this great, the whirls of nature up there. So that the plan formed immediately repetitive of nature itself and that is why I say the *genus loci* thing was very much that was the spirit of the place and that was the spirit that was repeated. One observed the way in which the natural evolution of mass occurred with wind and rain and erosion and all this and those forms were repeated. When one used floating elements or things, that came purely out of a whole system of seeing how the Aboriginals lived up there, the various life structures, you know bits of bark and leaf floating all over the place. It was also just the effect of clouds and their great tradition of tents in deserts and things like that that started to become a reality—of course that would be appropriate here and yes you could do marvellous things with them. The whole system of reasoning gelled in that. That wasn't the only reason. I liked doing hyperbolic shapes. I wanted to do something that floats above the desert floor. I want to do something that looks like clouds or has a whole system of other images whether I want to carry on the great tradition of nomadic architecture, tent forms in the desert. I want to do this and that, it is all this coming together and building up a pattern and reasoning that makes the final decision appropriate.

When you have a series of works, is there moments of insight that occur from one work to another where you might invent a rule or change a rule to make it work for a particular situation?

I think that is in every endeavour, every artistic endeavour, that one looks to that divine thing that is in art. I mean what makes art divine is that there is a creative thing that sometimes you don't even realise yourself. I go back to Lloyd Rees by saying—"It is not me that painted it is that other thing", that has happened and when you look in your work. You see many directions or you may see a singular direction that comes to that where you can take the next step and is often a puzzle that to you as a person, if I can see something that hasn't happened before in this, whether by accident or by intellect or whatever, but something has happened, these various forces have come together. You have got a new mixture there that is surprising and you see enormous possibilities from that and you can take off into a whole series of adventures from that happy accident that may have

occurred.

For instance?

I suppose that when if I look back at the architecture I was very intent with a whole series of spatial plays when I first was working with more modest materials. When I say modest materials they are materials that I love very much such as bricks, timber, glass, tiles or something. When I used steel for the first time and I saw something a new joyousness that happened after that of being seeing space and seeing a whole cultural aspect that I had ignored from the Australian viewpoint. I think that I was too wrapped up in the whole system of value judgments of an Australian architectural development. Then suddenly I started exploring through steel,—I saw space, I saw a whole new development and attitude which excited and put me off into a different direction. But still building on the philosophy of structure and of the spatial aspects of the work which weren't inherent in the previous architecture but suddenly there was a new dimension there of light and of lightness, defying gravity almost and yet with a strong cultural situation that I hadn't previously appreciated.

What would be the first project that that occurred in?

That was the National Athletics Stadium, Bruce, ACT [1974] and it is still a work that I love very much. I saw in that when I looked at the sectional forms and things in the landscape it gave me an enormous degree of satisfaction of seeing other possibilities.

Did that roll into your painting as well?

Yes, it was looking at that and seeing that whole new relationship between form, the imposed form and the natural form and the way in which the two interact to reveal greater truths. If I can talk about sensing reality between natural and man-made situations as well as spatial relationships that occur once you start putting objects of a particular strong geometry within the natural landscape situations and how both of them enhanced that frame rather than,—it ceased to become reality and gave you a puzzle which you could then think about and a memory of that in a sculpted sense was very important.

You mentioned philosophy, and changes to the philosophic tradition, of building a new language, — could you explain how you see your philosophical position for your architecture say, and how that might relate to your art. How has it changed, how are you building onto philosophical tradition?

I am not deconstructivist. I don't necessarily take the attitudes of Derrida or others who are very fashionable at this point in time—of establishing a theoretical position that one has an allegiance to, or a

particular viewpoint, however strong that viewpoint might be. I find that that would be inhibiting. I find that it is much better to virtually roll with the punches rather having a strict theoretical position.

Thankyou.

Richard Coyne: Interview by Dean Bruton

University of Edinburgh

2 August 1996

Richard Coyne is Professor of Architecture at University of Edinburgh. He is the author of the books, *Logic Models of Design* and more recently *Designing Information Technology in the Postmodern Age*.

What do you think of the idea of a "contingent sense of grammar"? How much do rules appear to carry over from to one work to another in relation to artworks?

The way I see grammars and rule systems is that they provide metaphors for understanding some phenomenon such as in this case as in art or design. The real question to me is, how useful is that as a metaphor?

How useful are rule systems as metaphors for understanding design and art?

Considering that question, you have to think about what do they enable and what do they disable. I guess the big issue about rules is that they are a very privileged entity within particular discourses. So the idea of rule is actually very much favoured in particular ways of thinking. If you say I am looking at design through the issue of rules, and you are saying something more than if you just say I am looking at it through other metaphors such as those that trade in inspiration or other ways of looking at design, because the ideas of rule suggests something determinate, something fixed. There is some certainty, something to hang on to, it is a kind of metaphysical concept. So I think the metaphor of rule inherits a whole baggage to do with metaphysics. That can be quite disabling in the studio because it is suggesting that there are absolutes and there are fundamentals that should somehow be underpinning what the designer is doing. So in a pedagogical situation that can lead to a false sense of certainties.

Would you agree with: "a derivation sequence according to rules is known as a grammar"?

I don't know. I am not an expert in that. I always thought a grammar was a set of rules. So in computational theory, you talk about a grammar which is a set of transformation rules. So the grammar is the set of rules, the rules are rewrite rules, and you may have several dozens or thousands of them and they constitute a grammar. I am not sure how the word derivation fits into grammar theory.

Perhaps as a derivation sequence.

OK, so you pass through a series of states. That is usually the way

that people talk about grammars in computation theory. You have a space of possible states which the grammar defines. So I guess the derivation sequence would be a path through that space of states.

How do you see the place of grammars in making new designs? — either as a loose analogy of grammar or a formal system of grammar? Could you comment on both?

The whole thing is most interesting where it is most formal, most rigorous and most determined. As with some of the designs you showed me yesterday. (They all weren't, but the ones that were, I think are the most interesting.) I think taking any computational system and exploring it to the limit and looking at it in the context of creating an artwork or a design can be quite fascinating. That's where it all belongs. If you start talking about grammars as somehow bearing some relation to cognitive function and design process, that's where it gets dodgy I think.

When is it useful to use formal grammars?

When you are making patterns, repetitive designs. Basically that's it I would think. Or perhaps in other context, when you are making some sort of statement through your artwork, in so far as an artwork does make statements. If you are exploring some aspect of the technological age we live in and the nature of, or the role of computing in the creation of art. Again some of the things you showed me yesterday are exciting explorations of computing in art. So the artwork to me is saying something about technology and computing and about art.

Could you comment on the idea of the reflective practitioner, and reflection in general, in relation to the use of grammars and whether it plays a big part or a small part in shape grammars?

One of the major points I get from the Donald Schön's notion of the reflective practitioner is that you're engaged—he's not all that clear on it, but the way I and also colleagues (such as Adrian Snodgrass) interpret this is to say that what's going on is a literal dialogue between student and tutor. So as the student does something, such as generate something, the tutor comments, then the student responds to that comment. So there is dialogue of that quite literal kind going on. Also there is a dialogue going on between the designer and the design situation which is probably the most general way of looking at it, and the situation consists of the materials and tools of the design process and the actual artefact as it emerges through the design process. So as the designer is working the design is speaking back to the designer.

We can pin it down quite tangibly. What's happening when I draw a sketch design that is the start of a floor plan I might start with a rectangle or something. As I draw the rectangle it presents itself to me in various ways, through various metaphors. And so I see that rectan-

gle maybe as square, as a geometrical entity, or maybe as a room. I might see it as partitioning the site in some way. Anyway, as I am working, I see it as lots of different things. Through that seeing, I then make modifications. There are various entailment that come with that seeing process. So if I see it as a geometrical entity like a square, then perhaps because of what a square means to me there and then at that moment I draw a diagonal through it. And then through that process create some other entity, then that speaks to me and I modify that entity. So to me the whole process can be explained in this manner of "seeing as", which is Schön's notion. I think Nelson Goodman and others also talk about that process as you are drawing. So you are going through various transformations, you the designer and the thing you're designing. That can be seen as a dialogue, as a discussion.

Now, if you then throw in a concept of rules to that process I am not quite sure what that means. You could say in retrospect, having looked at what you have just gone through, "Yes I can see there were various rules in play, but the identification of rules has occurred after the event of designing. It's a way of interpreting what you have just done" and that seems to be fine. But if you were to say "my process was driven by rules" that would be another matter. I don't think the process can be explained in terms of being driven by rules.

Do you think of only formal systems rather than the "loose analogy of grammar" as being driven by rules?

I think the grammar idea only has great interest and value when you see it very formally. I don't know what an informal grammar is really. Other than a kind of metaphor. You might say to the designer, "Well, it is as if you are using rules here." I don't know that that is very helpful, and the notion of an informal rule set inherits its "credibility" from formal rules. This is part of the nature of the privileging of the whole discourse about rule that when you start talking loosely and informally about rule, you are inheriting a whole history and set of ideas about rigor, foundation and certainty.

Can you give some examples of artists who appear to work with fairly strict rules?

I am not a great one for knowing much about the art world. I don't really keep up with it, but the celebrated cases I suppose are people who work in the computing area. To my shame I only know two names that are particularly interesting: One is Harold Cohen, an American artist. His approach is obviously a rule based because he uses little robots which are programmed. There may well be randomness built into that process and I think he has even used lots of different algorithms throughout his career to do these systems. There is enormous skill and artistry in the creation of those programs. I would never say it is the computer that is creative, it is the artists, the programmers and other people that have contributed that pro-

gram of work. Then the other person I know is a friend in Loughborough, Ernest Edmonds, who is a computer scientist and artist.

Do you think they worked in a reflective way like in the Schön model of the reflective practitioner?

I am not entirely sure. I haven't read of much of what they say. I know Ernest is very reflective on the whole thing. I don't want to put words into his mouth but I would certainly see it as a way of commentary on art in the latter part of the 20the Century. It is not just rules per se but it is the use of rules as part of the art experience.

Do you ever use computers as a medium for design? If so, what would your experience be involving derivation and rules?

I suppose what is interesting is using a tool, or a CAD tool or a three D modelling tool, *Form Z* or a 2D system like *Photoshop* and actually designing something. I have not designed buildings recently, but I have designed course material and tutorial examples and also graphic design work for brochures and posters, and all sorts of things. Anyway I have been involved with those tools in creating designs and yes, you can. Those tools have constraints built into them, they present various metaphors to you, and through that you design. To me, the metaphors invoked when I use *Photoshop* to design something are a more useful way of looking at what is going on than looking at notions of rule.

Could you explain the use of metaphor briefly? Why is it more useful than the rule?

Taking a simple interaction like you have with Photoshop: To say Photoshop is comprised of a series of rules is not all that helpful to me. To say that is presents you with a range of metaphors, is really exciting because then you can start to talk about the relationship between manual drawing and drawing on the computer. Obviously the way *Photoshop* and lots of other tools have been designed is to take account of accepted drawing practice, prior to computing, whatever that might have been. So there are notions of overlaying drawing. That is a metaphor that has been inherited or imported from the manual drawing world into the computer world.

Then, also there are obvious things such as paintbrushes and spray cans and various other tools you are presented with which you understand metaphorically. There is some sense of "drawing" with the mouse, and using those various tools in *Photoshop* is like using a paintbrush or a pencil. Then, probably the most interesting aspect of all this is that, according to the theory of metaphor, metaphor is not just a simple transference of one thing that is understood onto something that is less understood. There is a reciprocity in the play of metaphor. So things feed back onto each other and in complex ways. I think it is interesting to see what happens. In the case of

Photoshop, the idea of layering is like layering sheets of paper as you're drawing. But in other ways it is very unlike layering by drawing. There are a whole sets of new ideas that emerge to do with layering by using this tool that never probably occurred to anybody just layering tracing paper.

The other thing I think is exciting, is that using the paint system feeds back into the manual drawing process. So I will never see drawing by hand in the same way again having used a computer system like *Photoshop*. In fact the whole idea of layering is probably something that has emerged more from computing than from manual drawing. The concept of layering has really taken off thanks to CAD systems, drawing and paint programs on the computer and has developed a currency all of its own quite independent of any notion of layering in drawing.

I guess it is now only in retrospect that we look back on the drawing process and say, "Well yes, the drawing process is all to do with putting layers of tracing paper over each other." So I think it is complex, but there are all these intricate reciprocities going on between metaphors. So using the computer helps you understand manual drawing in particular ways, in new ways, and also you get to understand what is going on as you use the computer in new ways through metaphor.

Are there any artists, designers or architects whose work you regard as particularly grammatical?

I have made a study of the shape grammar phenomenon. I know what you are driving at. I suppose a grammatical work would be a work that seems formal, has a lot of repetition and there are lot of variations on the theme. The variations are of a mechanical kind. That is very interesting in art and design work. I mentioned Harold Cohen and Ernest Edmonds. Peter Eisenman has made great play of the role of grammar and syntax in his building designs. He claimed, at least in the early work, that there was a lot of rigor. He was following rules in a deterministic way. I am somewhat sceptical of that, but nonetheless I suppose his work is very grammatical if for no other reason than that he has made it so through the discourse in which he embeds his work. He has written so much about his work, and he has described it grammatically: QED he is a grammatical designer. It is a part of his discourse. His design is inextricable from his writing about design.

But he must be an example of someone who is using a "loose analogy" rather than a formal system. Would you say that is true?

Yes, but it is not to denigrate his work, in a loose sort of way. Maybe Terry Knight and George Stiny's work is looser than we think!

Would you agree with the statement that "Design is

computation"?

Yes I would agree with that statement. Design is computation. I would also agree with any number of statements that have an "is" in them because they are metaphors. So yes, design is computation. Design is the free flow of ideas. Design is a bolt from the blue. Design is the play of metaphors. Design is reflection in practice. It is a range of "is"s.

How do you distinguish art from design?

Well, the answer is not very profound. I am not an expert in art. Perhaps one reason I am in design is that I have never fully understood art, ... if I understand design. One of the major differences is the nature of the discursive communities that surround and embody those two disciplines. Art practice is a different discursive practice to design. That is, the things artists do when they are in front of their canvas, or are presented with their medium, is very different to what designers do when they are presented with their media. The way artists talk is different from the way architects talk. The institutions that are set up to support art are different from the institutions that support design. The literature is different. So they are different cultures, different discursive communities. What makes art is simply what fits within the discursive practice that is art. What makes design is something that fits with the discursive practice of design. Which is not to say that the two disciplines are discreet, homogeneous in themselves or hermetic.

Thinking about the development of your writing and ideas. My first introduction was through the knowledge based design systems book. Could you tell me why knowledge based design systems perhaps now seem, if it does, an inadequate area for research. for you? — that is, does it hold as much interest as it did in the past?

There are a lot of answers to that. There is a cynical answer: that I stopped getting funding for it. But the fact that I and many others started to encounter difficulty with funding was because of the recognition generally in the research community of the shortcomings of knowledge-based systems. The promise that was offered fifteen years ago, probably twenty years ago, hasn't come to fruition. No research program can retain the incredibly high profile that it began with and produce so little. It has produced stuff but it is in no way commensurate with its initial claims, so support is bound to taper off. A lot of research programs have been casualties of that drop in support.

Another answer is that it just doesn't work, in my view. Knowledge-based systems trade on the notion of reduction. That is not a very original criticism, and takes on board what Hubert Dreyfus said on several occasions, that "Computers have called the Cartesian cogni-

tivists' bluff". In other words, if Descartes was right then we would have intelligent computers by now. "If Descartes was right" refers to AI, cognitive sciences, formal methods, grammar, systems—the whole rationalist thing. If all that worked we wouldn't have this struggle. We would be there. We would have our intelligent computers controlling rocket ships and things, and helping us out.

The reason computer systems aren't intelligent is that the whole Cartesian idea of beginning with parts, and through those parts building up a big picture, just doesn't work. Computing proves that quite powerfully. Talk to any hack computer researcher. (I regard myself as having been one—that is, somebody who rolls up their sleeves and spends hours in front of the computer writing code, mucking in with systems like PROLOG.) You try and build up a computer system that designs or innovates or just takes off in some way on the basis of a set of tangible, discreet entities like rules, and you find lo and behold the system just doesn't take off! It just lies there. It does what you told it to do. It fulfils the requirements of your very constrained domain which you defined it to work in. The more constrained the domain the more "successful" the system, to the extent that the only way you can get a system to work is to get it to do very little. I think that was rather demoralising for a lot of us. Many have found that and have come to that conclusion, at least I have come to that conclusion.

My opinions about AI were also subverted by reading, and by other people influencing me and directing me to other ways of thinking. It opens your horizons to see that the whole Cartesian program has been under challenge for the last three or four hundred years, more interestingly in the last one hundred years since Nietzche, and certainly in the last twenty years. One of the problems with the AI community, and possibly the shape grammar community is that is kind of blinkered. For example, they don't seem to be aware of phenomenology which is a whole field of study that developed on the Continent and presents holistic ways of looking at phenomena. For a long time they have been restling with the notion of the inadequacy of working with parts and building up a picture of the whole. In the last twenty years, thanks to lots of bright American philosophical scholars, lots of Continental ideas have been brought in with American pragmatism, and lots of interesting insights have been developed on how we work and how we are in the world.

Do you think the holistic view, the phenomenological view can be combined with shape grammar so there is a kind of fusion of the two that might be productive?

No. Because what you are talking about are incommensurates. I have been referring to a discursive practice or a community of thought that includes phenomenology. (I should say "phenomenology and its derivatives." I am not quite sure what the current entity might be

called, maybe Continental thought or postmodernism—a set of discursive practices and their various debates that embrace something of critical theory, poststructuralism and other schools.)

Continental thought has two interesting claims, one is to be "universal". [This is the careless pub philosopher speaking now rather than the serious amateur philosopher.] A universalist mindset claims that the ideas it's putting forward are the account. But in making that claim, Continental thought makes a second claim—that it's account rests on non determinacy. (We would say "indeterminate". Derrida would say "non determinate". For him anyway the discussion gets out of the debate about determinism verses freedom.) Continental philosophy claims universality, but in doing so it claims that the universal is non determinate. The ground of its theories is in a state of flux. The Continental discourses have taken their critiques into themselves. It's not really possible from a contemporary phenomenological point of view to stand outside Continental philosophy and criticise it, because phenomenology embodies its own critique. If you say to a phenomenologist "Well it sounds to me as though you are speaking absolutes here, because you are saying look, there's the whole and that's a certainty, and the parts are derived from the whole". A phenomenologist would perhaps respond, "We know all that, and that is part of the discourse of deconstruction and yes, we are restling with that issue." It doesn't mean the whole edifice of phenomenology or Continental thought or deconstruction falls apart because you find an inconsistency in its discourse. It embraces inconsistency, it embraces rupture and discontinuity, which is not to say it embraces relativism.

Now take a discourse like grammar discourse. For one thing, it's a totally other discourse. It's scale is entirely different than the phenomenological discourse. Grammar discourse belongs to a circuit of people who number less than a couple of hundred, I would contend. So there is a difference in scale there.

Also the discourse of rule and grammar is not a post modern discourse. It does not embrace notions of rupture. It hasn't institutionalised its own critique. Papers on shape grammars are not reflexive about the whole issue of shape grammar and its strengths, but more importantly its shortcomings. There are no papers that I have seen yet that have the appellation "shape grammar" that discuss a design situation in which no rules seem to be in evidence or where the grammar seems to fall apart at the seams. The way the grammar discourse seems to work, as many discourses do, is by exclusion. So whatever doesn't seem to fit within its confines is excluded from discussion.

Can you give an example of a grammar that falls apart, say an instance that you have experienced that should have been spoken about?

Yes, we had a student some years back who decided to implement, or at least to study in detail with a view to implementing on the computer, the Palladio Grammar that Mitchell and Stiny articulated. He found something which no doubt they are aware of. From an initial state, which was a point or a cross or something, and working through various derivations and optional derivations, he found derivations where the grid keeps growing with no limit to the growth.

So that was a case, to me of a grammar that seemed to have no end point. That also raises other questions. If that grammar is meant to represent a corpus which they define as some subset of the work of a designer such as Palladio, including designs which Palladio never created but are in keeping with his style, I don't think they can claim that a set or a space of designs which includes designs that don't reach an end state is a legitimate design set. They may of course say, "Yes, but the way this formal system is defined is such that only shapes that satisfy the end condition are legitimate designs, where all the labels disappear." It would be interesting to explore that as well and see if in fact it is possible to generate Palladian villas which are hundreds and thousands of bays wide and the labels have all disappeared.

I am not about to embark on that sort or proof or disproof of shape grammars. You asked for an example of where they haven't explored the limits of their work. This is a case. I think it would be fascinating to see a paper from that quarter that explores the limits of shape grammars which I think could be quite illuminating for the field and might help it move forward.

Why is there some doubt about hermeneutical aspects of grammars?

The difficulty is that the rule discourse claims a kind of universality. Grammarians would probably be up in arms and say "Oh no we don't claim that". Nonetheless the whole rule discourse gains the credibility that it has to its adherents because of the priority that the Enlightenment (and Descartes, and remnants of our culture) still give to reason as logic. There is the baggage that comes with the notion of grammar, rule and formal systems. That's why they pursue it. That is the cultural background we all share. That's why it is regarded as important and interesting to look at grammar, rule and formal systems. If that's the case then implicitly at least, the authors of these systems claim to be getting to the essence of something. They do claim to be getting to the essence because Terry Knight's new book [appears to be about style and the essence of art and so on.

So they are claiming access to essences, which lots of discourses do, and perhaps even hermeneutical discourse claims that to some extent. OK, so if it is claiming access to essence, where in the rule discourse is there an explanation of the hermeneutical process? Yes,

certainly if you are using a computer system or a geometrical system or a rewrite rule system or one of their grammar systems, every stage involves interpretation. You have to apply this rule to this situation and because there are so many possibilities you have to make a decision about choices following a derivation path, as you put it. But where in grammar theory is there an explanation of that process of selecting the right rule and the right step in the derivation to go to next? That's a rhetorical question, and I don't expect an answer. I don't think there is an answer.

In so far as anyone would claim that hermeneutics is tangled up in the process because we have to interpret rules and we have to look at the final design etc,—grammar is mute on what is going on there. Something is left out, something important which is the interpretative process. So how can it possibly claim a merging of theories, the hermeneutical and the grammarians".

What they should come up with by rights, is a grammar for interpretation, explain the process by which we interpret a drawing as a grammatical exercise. I guess they don't want to do it because its rather murky. Of course you get out of formality. You then have to enter the realm of Noam Chomsky and structural linguistics and all its different flavours and that's the are of discourse that shape grammarians have shied away from saying, "We are not structuralists, we are not into semiological theory, Saussure: the importance of difference", and then,—Chomsky's more recent interpretations in terms of grammar rules through which he derived meaning".

So they have cut themselves off from that discourse. That was something that I tried to look at when I was pursuing the grammatical approach, I was trying to look for the rules for interpretation saying there were interpretive rules as well as generative rules, and you have these two systems coming together. Very murky trying to implement it,—and it doesn't work. So there are good reasons to keep away from it from the grammarian's point of view. Nonetheless there has been something left that is very unsatisfying. You've got the formal system and then the process of interpretation that goes on around it but then grammar rules that don't account for interpretation.

Do you agree with the idea that if you select particular forms or structures and then represent them with rules that automatically there is a particular interpretation by the designer imbibed in the reusing those rules to create a derivation?

To me, interpretation, if the word is going to have any value at all,—I mean you often talk about a computer program interpreting something. In this context of discussion about hermeneutics you mean: we

interpret, that is we are caught up in an interpretive field, so to say that one derivation through a rule system is passing to another derivation is to not say that is interpretation—by a normal hermeneutical notion of interpretation, there is no interpretation going on. It's a mechanical process that is going on with rules and shape grammar.

Can you say that feelings or thoughts about a particular set of work embodies or communicates with a particular set of forms once analysed in grammatical grammar that the derivations from that grammar would generate the same kind of communications or feelings that were in the original body of works?

They might, but it's not all that interesting for me to say they might or to agree with that. It's not particularly telling, it's like saying if I take a photocopy of a picture—looking at the picture, the photocopy will have the same effect as if you are looking at the original. That is not all that interesting. I suppose you are one removed from that, because you are saying, "If you can write a mechanical system, even not say a grammar for designing Frank Lloyd Wright type buildings and if you built them, would they have the same impact as if they didn't?"

Unfortunately, it's complicated. I don't think you could do it in an interesting way where you could really claim the computer did it. That is the other point: like with chess playing and the like,—if the computer system does something that was clever, it is not the computer system that is clever, it is the hacks, the people who sat down and laboured over the rule system. Like Terry Knight or George Stiny, labouring over it, however they did it—it would be fascinating to have been a fly on the wall to see the process of constructing all those painstaking grammars and little labels and things. The genius, if you want to credit of the process with genius lies with the people and their creation of those systems, not the computer. To me they are interesting questions to discuss.

Thankyou.

Julie Eizenberg: Interview by Dean Bruton

Koning and Eizenberg Architecture. Sketch of a grammar of facades.

Koning and Eizenberg Architectural Studios, Los Angeles

3 July 1996

Julie Eizenberg is an architect and lectures in architecture at the University of California, Los Angeles. Hank Koning is a partner in their architectural practice that utilises shape grammars.

Did Koning and Eizenberg get together through grammars?

In the early stages, Hank Koning helped me get material together to have a look at it. He understood better where we were coming from. Since then he has become, he was already on the way to it, of becoming a very key player on our design team.

Did you make a grammar of a your work to help generate new ideas?

No, it helped us sort of. If you say "doing a grammar", some people argue that a grammar is self limiting, it limits what your choices are and that therefore is not a very creative way to do things. That is one argument.

If you believe that you can't go through every possibility of the universe anyway, and that's a pretty unproductive way to work and, that you have a natural predilection to select, so that you have a sort of an intuitive framework. You know, you could call it "taste", you could call it whatever you want and in which you make decisions, then the idea of having a grammar is basically just helping you find out what the parameters of the decision making are. So it's just sort of a shortcut, it doesn't necessarily generate new ideas, it might, but it clarifies what the limits of your decision making are.

Now you can see, it is happening intuitively with everybody anyway, you couldn't distinguish one set of work from another set of work. How do you distinguish Hockney from Lichenstein? Hockney is not interested in Lichenstein, Lichenstein is not interested in Hockney. If you able to tell one visual artist from another there is definitely a set of choices.

Now the grammar part that I work with is the shape grammar part. George Stiny has basically now worked out of visual algebra. I think it is formalised. You know how you had, once you got algebra with maths, what you could do with numbers, went bananas.

What he basically did was set up a formal system of describing shapes and visual elements, shapes and spatial relationships and that whether you construct a theory for how you do things or not in the end you have to make something physical. He now has a mathematical construct for which you can describe those things, and then using

the grammar as his algorithmic base for visualising those things. It can be 3D or 2D. The algebra is now set for different dimensions, it doesn't mean you can't bring descriptive or evocative mediums to it, there are all sorts of subtleties built in.

Terry Knight is doing some stuff, it continues to get stronger rather than weaker its accounts for more intuitive ways of doing things as it gets more depth. Its a relatively young thing. That's why George got such fame and notoriety because with this visual grammar thing that you can start to get a better understanding of the composition which has been pretty much neglected. The composition being what you get, if you make something.

The theory base leaves out that big compositional gap when you go from theory to practice. If I have an idea and I say,—this is sort of a petty way to do it: "My works reflects the way modern life is crumbling and everything is falling apart". Well, there is about 400 million ways of showing how life is falling apart and crumbling, it just doesn't give you enough specificity to control decision making. It is one of the aspects of it but the compositional thing is very precise, you can't mess with it, either it is, or it isn't.

How do you build a grammar?

There are two ways of building a grammar. This is my experience of it, and it is pretty limited I admit. It is that a grammar is an algorithmic structure so its pretty cut and dried. You can't mess with it. You can't use rhetoric for example to make a grammar something else. It doesn't preclude the numbers or means of understanding.

You can make the same object from a number of different grammars so there will be objects that overlap. You can read an object made by a grammar in more than one way. That is not precluded, this is it, this is an example in the language. So if that is the case, what you are doing when you use a grammar as a base is, you say: *what you have is a mental construct for a range of possibilities*. That is how I see it. In that range of possibilities I'd say, "I want to be able to do as many things as possible but I don't want to generate anything I don't want".

So, you've got in the grammar the structure for how you think about things works from both ends. I've got to make sure I make everything I want to make this, I want to make this, etc. Then you've got to say, "Wait a minute, I don't want to make stuff I don't want", and that is the balance between those two mental exercises when you are making a grammar, particularly when you are doing analytical grammars, which is all I've done.

In your work now, when you start drawing, do grammars still take part in what you're doing, or has it subsided?

It's not that it's subsided I think its just embedded. We are much more secure about just doing stuff that we want to do. We don't have to be anybody else, so there is a certain autonomy it gives you.

So you have decided on a certain number or set of rules?

Yes, when they get boring, then you will you develop it. Modernism is a great example, say in painting, you just keep testing.

Have you got some people you might suggest, artists, designers, architects?

You can look at anybody really, the more complex the better to look at it because the more consistent, for example, Daniel Liebskind. A student of mine did this. What I asked the students to do was to look at somebody's work, an artist or whatever. What they had to do was look at three as a minimum and design a fourth in whatever that person did. Some students did buildings, some students did artists. Lebius Woods is considered to be as a charismatic creative free spirit, you know. This student did this very convincing Lebius Woods.

With the grammar, it is only one part of it. I am not saying you don't need the craft skill, I am not saying you don't need an internalised theory. I am not saying you don't need a way of seeing the world that's basically what's modified by one thing: the grammars is the physical expression, the synthesis of those things.

Is it generalisable to works of art? Even with the formalists, they go from loose analogies to very formal systems of grammars?

But you don't have to have anything that is considered to be formal to make a grammar. So it really doesn't matter, it is basically a framework for describing anything that is visual.

It doesn't have to be tidy. I think what the thing with grammars and I think it's partly to do with that guy in San Francisco, Christopher Alexander and those people,—that grammars are prescriptive.

Grammars are only prescriptive in that they prescribe what it is that you want them to do. But there are as many grammars as you can think of, that appear as complex. If you can configure complexity as one of the choices you have, you can make things look orderly, you can make them look complex, it is just another set of choices. I think it's most valuable part would be in education if people would buy into it.

That is what I am trying to do.

Well, think about it in an education context. What happens in designers studio with architects? Each time you go to a studio you are told look at the site, look at the program, invent a response, then you are slapped on the hand if you do it wrong, praised if you do it right. Then you go to the next studio and they say look at the program, look at the site, do it again and you are slapped for different things. So each time you go equals a kindergarten, basically we teach like kindergarten but there is no construct of building body of knowledge about any particular point of view, so you learn nothing basically. Or if you learn you learn in spite of the system.

Was that part of the division between architecture and design at UCLA?

The architects were terrified of these people, absolutely terrified. It started first as sort of an anti-machine bias. This was 1979 and then everyone was panicked about machine use. We as uni students went in to George Stiny's class. What he said what was, "This class is talking about how machines can design". I stuck around because I thought it was preposterous this guy can't go around saying this sort of stuff. I love an argument.

Then we slowly understood where he was coming from but there was a great fear among the art side that this was anti-creative, that it was everything but what art was about, machines were bad, computers were bad, numbers were bad, art was good, art was free. Then over the last 5 years with the development of visual graphics that bias has changed completely so now machines are good, they are healthy, creative zippy stuff so the bias is decreasing, but they are still not ready to bite off and actually incorporate the conceptual basis for all the things they can do in an education system, so that's where that's all coming from.

When is it useful to use formal grammars?

Education, anytime, I've seen people design,—Terry Knight will show you some students who have designed grammars from anything, new languages.

Is design computation, do you agree with that idea?

Yes, design is thinking.

Then how does art fit into that definition?

Art is thinking, I think people have got screwed up since Ruskin. It's absurd. It's a thought process. I can't see how it isn't whether it uses left brain cells or right brain cells it is still a thought process.

So, art has rules?

Absolutely, I mean how can you tell one painting from another if there aren't rules to work to? How do you do styles, how do you distinguish between Renaissance to Baroque unless there are rules?

Do you think in the educational area if you introduce grammars would you introduce it in a three dimensional way or would you stick with shape grammars or both?

Shape grammars are three dimensional, they can be four dimensional. George's algebra defines whatever number of dimensions there are that people who have knowledge of, I can't remember how many, I am not a mathematician.

But at a introductory level?

I don't think it matters. It depends on what your area of interest is, and also the only problem with 3 dimensional grammars is that to

model them takes more work than 2 dimensional grammars but with computers make it easy to manipulate the shapes and display them, then you can use 3 dimensional, it is basically a craft thing not a thinking thing.

The idea initially was to look at a work that had been done and to look at a current work that is maybe in process that might use rules in some way, to talk about how you came to the form using those rules, how the form may have changed, and how the rules have changed.

I think the thing that we have a difference of opinion on is that you think of a rule system creating a one off project/product.

Not necessarily.

It can't, a grammar doesn't make a one off product, grammars defines a body of examples, so that when you are saying here show me one object made with a grammar and show me another object and what are the differences? They're both of the same grammar.

Take Frank Lloyd Wright,1901 to 1915, if you take that as a historian based definition of what a style is. I didn't make it up, they did, all those houses. We did one grammar, there's probably another hundred to do. All those houses could be made with the same grammar no matter if they were done in 1901 or 1914. To a certain extent the boundaries of where a grammar begins and ends are arbitrary. They're set by the designer.

So if I looked at your previous one I'd be looking at your current one as well?

Yes, things that happen in that happen because, I can, here's something done with this. [looking at my *Tartan World* series of images] This clearly, you like the issue of transformations. Well, the symmetry, transformations, have you been studying symmetry too?

These were early experiments.

They are all tessellated, there is a structure in here, and then there is another layer that pops up from that structure and plays against it. Right,—and the way you can read them,—so there is a consistency in these things.

These were variations on a theme just using *Photoshop*.

But you know, is the finished artwork one of these or all of these combined?

None of these were finished, they were just experiments at the time.

No, but is the finished art object the series of 3 or the series of 1.

Well, both.

Every time things are presented...

I've put these together, initially it was just an individual image but when I started thinking about it I liked the idea of the combination, so I started putting them together to show the comparative development.

Right, but you also liked the play between the two.

Yes.

I like it too, there is sort of a rhythm, there is a sense of something pretty simple, then it develops. I mean that stuff is in all of this, so it's interesting when you see how it's changed.

The grammar we did, is just a bunch of rules, we haven't got it very far, but if you looked at the rules you couldn't see the final building. You had to apply the rules to do it. If you look at different rules you get different results. I'll show you a couple of buildings that we've done.

Thankyou.

William Fawcett: Interview by Dean Bruton

Cambridge, Architectural Research at Cambridge, England

27 July 1996

William Fawcett is a partner in the Cambridge Architectural Research firm. has used computational applications of shape grammars in architectural research and practice.]

Can you tell me about your background and what you have been working on as far as grammars are concerned?

I started as an architect and did a bit of research in the 1970s and in the early 80s I come across the ideas that artificial intelligence and immediately found it very exciting and immediately started thinking how they were relevant to architectural design and that fitted absolutely together perfectly with the shape grammar ideas which were already in circulation, I was already aware of those, as an observer, from when Lionel March and George Stiny were at the Open University in Cambridge in 1970.

So I was aware of these ideas and then I saw through these of kind of ideas as AI. That was something fantastic for architectural application and I got really enthusiastic and at that time I was teaching at the University in Hong Kong and started doing work with students, trying to interest them and explore these ideas. It seemed to me that this was it. Then I came back from Hong Kong to the UK and I tried very hard to make a go of it trying to find a way of really devoting myself to this enterprise and to shape grammar based CAD's actually which I thought was the thing that was going to come. I wasn't able to find a mechanism for following that line so I developed other things.

But since then which is now ten years ago I have maintained an interest and done bits of lecturing and bits of very modest sideline work in the field trying to maintain an interest and also to some extent spread the enthusiasm to other people. But I haven't really been able to create the opportunity to really push it in the way that I think it has the potential, or I thought or still think has the potential, so my interest has been much more as an enthusiast than a real worker in the field for some time now.

I am less interested in grammars as means of representing designs of others in the past than the relation between the concepts of grammars and the process of making designs, so it is the idea of generating designs through reflective practice and use of grammars. You mentioned that there was some resistance to the acceptance of rule based grammars within architecture, can you explain or give some idea why that is the case?

When I was really trying very hard to work in the field essentially as a developer in CAD so I was talking to CAD specialist people who were either professionally or in business involved in CAD development, trying to explain the idea and trying to communicate the potential and how important it could be, there tended to be two reactions. They said either it's trivial and not worth following up or it's far too complicated and therefore not worth following it up. Between these two points of view nobody at that point seemed to want to take it on and do it, they said, oh well, it's obvious it's useless or, you'll never do it, it is impossible, so it's pretty frustrating.

What is the solution, do you think some kind of education about the advantages of grammars would be appropriate?

Well, I think some ago and I think in a way in terms of CAD tools, and CAD tools have developed tremendously over that period and CAD is widely seen not just as a drafting system but as a way of building more and more intelligence. I think the kind of innovations were just happening piece meal and I think although people might react to say you can move from here to somewhere very distant is, oh well I can't envisage that, actually step by step it is happening anyway. I must say I am not as familiar with the latest CAD tools as I should be but I think they have a lot of these facilities now, just by incrematic development that one is imaging.

Do you think there is a difficulty with attitudes towards grammars because there is some kind of stereo-typing because anything to do rules is narrow-minded or mechanical?

Absolutely, yes. Throughout the design community, my impression is that that is the standard response, the reason you are a designer is because you have inbuilt talent and so on and which is the opposite of guys, engineers who follow rules. I think that is the standard reaction is to say, we are the guys who don't have rules, which I don't agree with.

In your dealing with grammars do you see a place for Schön's idea of the reflective practitioner?

Yes I think that is right. Most of the papers, or the early papers published on grammars were replications of historic styles, Palladio, Wright and Terrangi and all these papers published in the 70's and 80's, very exciting papers, but they were all demonstrating the technique by its ability to reproduce what you recognised as existing architectural designs and very powerful. Then you say well they are all existing, how do you use it for something new and of course in order to be able to do that, you would have to not merely apply rules but create rules and I think that is necessary for it to be a real design tool, you are not just applying rules which are given, but you are developing, modifying, adapting rules and then you have got a real design environment and that of course doesn't apply when you

are simply using it to analyse, reproduce or replicate any already existing designs.

Do you see a continuum between the loose analogy of grammars and the formal systems that grammars might use?

The word, grammar of design isn't used a lot used in a loose way.

Perhaps I can define it a little more, derivation sequence according to rules, is known as a grammar. Would you agree that?

I think the word is used even more loosely than that isn't it. Wright took up grammar of design, but he did talk about grammar of design. He said "If you don't have your own grammar you've got to use somebody else's, you've got to have a grammar you can't design without it." What he actually meant, I mean how does one know what he meant, but except in a very loose way and I expect his use of the word was very loose and had only a kind of hazy understanding, you have got to have a grammar otherwise you are lost and that is a very loose end of the spectrum through to having very explicit and precise rules which is the other end of the spectrum.

I am sure there are positions everywhere in between every possible extent of precision and fuzziness could exist and be put forward by a designer and so I don't see there is any discontinuity as a loose thing and then a sudden break and you get into it precisely, there must be a continuum.

As an architect developing through so many years of professional work, do you find that you are more conscious of your own rules and your own grammar as you continue to work in your consultancy here?

It's a very embarrassing question really because, when you are actually faced with a real project, the explicit tool, I mean I was always thinking that what these tools should be built into a CAD environment because they don't have to be the idea is equally valid not in a CAD environment, but that was always my vision that you would be able to have a CAD environment in which these tools were embedded and such a thing doesn't exist, but nevertheless you don't have to have a computer either to use these ideas. So you say have you been using them and I do very small scale limited amount of architectural design on that and I would be hard put to say that I have ever explicitly create a rule system and then play with it to explore the nature of the problem and make the solution. I am terribly intuition based, you experiment and write a solution and say that is good enough, we will go with that.

Have grammars perhaps contributed to your intuitive powers to make judgment?

Everything is, what people say is that they are intuitive action isn't their intuition at all it's the kind of stuff that they have learned and

make progressions. There is a single story building in Cambridge, a lot of buildings were sort of several storeys, but they did one building which was a single story pavilion which was obviously a somewhat different problem and there you could see that the elements they had used in other buildings were actually used differently because it was only one floor so the roof could be handled differently and I think that shows that the way, that having a vocabulary of elements which you can use in different ways gives you a tremendously powerful tool for design. You get a new challenge and you can do something fresh, even though you are relying on past experience, you've got a new opportunity you can re-combine things and do something new.

How do you see the place of grammars in making new designs, either as loose analogy or formal system?

I see the potential, but whether, probably there are other people who exploited it, in a sense they are sitting back and explicitly saying, building up a set of rules and saying "We will explore this and see what we get to".

The examples which I have only acquired second-hand, I've seen student work from UCLA Masters Course, the courses that were taught by Terry Knight primarily, and there you see from a very simple idea of shape relationships you build up, you start something simple, take them probably arbitrarily and you exploit the potential and you end up with the results which you can't imagine could ever have been conceived of in any other way. They are so distinctive and unique and they are the sort of thing that nobody could have suddenly flashed on you, you could have only ever worked your way towards that through a lot of steps. And you can't see how those steps could have ever been taken other than through the actual route that they actually took, so in terms of student project work, you can see what looks like a prototype of a mechanism for creating things that you could never have thought of without that path to follow.

But why is that path of rule based grammar any superior to bubble diagrams or some other arbitrary selective systems?

You are probably right in that the ability of any explicit system is that having set down the explicit system you are carried on by it. So the fact that it is a shape transformation system, rather than some other explicit system, they may have other similar characteristics that by making it explicit, it actually has a life of its own and becomes like a partner. So I suspect the idea of having, of making your actions explicit and precise and trying to externalise them, I would think is very valuable through many other routes other than shape grammars. Shape grammars are one way of doing it which I find particularly attractive, I mean bubble diagrams are usually used in order to analyse spatial relations rather than the form of geometry of physics of the building, so the tools are doing different things.

Can you describe when it would be useful to use formal grammars?

I think now it may be two sort of extremes, in the context of CAD I envisaged the use of rule based tools entering, becoming useful at a very low level for doing very essentially simple tasks. In a way they already exist. There are some CAD systems where you can define those parameters and then the system self generates a staircase. You can see the height, the rise, you know the overall rise, number of treads, various other characteristics and then from that the system will actually create in place all the components which are required to achieve, which is really a rule based, I don't actually have a program in that context, but that is a kind of rule based thing from certain input of things, you have rules which derive the output.

I think there are many opportunities, in a sense in routine low level design tasks, where you can write rules and those things become automated. The other extreme, how you can conceive of things beyond what your imagination unaided would be able to spontaneously think of and that is kind of the other end of the idea of very, what you would think of is the imaginative and creative aspects of design. How you build a useable tool to do that is perhaps a little harder to see. Although I can see the potential of it, but how you make office tool for that is a little harder to see. In a context of student projects I think people do it because student projects are slightly detached from office practice. So I see the thing as being useable at a mundane level, I can clearly see how that could be done, but the kind of broader and conceptual level I am sure it has potential but it's not clear how you would make a tool that would exploit that potential.

I was thinking of the graphics calculator that came out with the new Power PCs, it was the latest toy where you could make an algorithm or an equation and it would compute a form in space. That is almost a kind of generative, formal generative tool.

That is right, you grab parameters and you see, well you just see what happens vary the input etc. There is a mechanism between your input and the form it has generated.

John Lansdown is suggesting that rule based grammars weren't much use and that really we should be working on a more purist way where you start from an algorithm and let it run and see what happens. Is that a practical pragmatic thing?

I tend to think of the opposite end, that really looking at these things as tools to help designers in the various steps in the process of design you use a tool to get to the next step. Therefore the process is very much under the control of the designer and he relies on tools but nevertheless the designer is deciding which tools to use and how to use it and deciding what to do with the results. I've always tend-

ed to think of it as a tool of that type rather than as a replacement for a designer to say "Well I don't need to design, I've got this thing", but I can see again that there is, the extension of how much the designer does and how much the machine does, it's obviously completely up ended I definitely take the view, or sort of on principle, you can't say, the tools stop here and the designer stop here, you can never say where that line is, you can always push that line further. The tools and mechanisms can always do a little bit more than it does and there is no limit to that.

Do you ever use computers as a medium for design? And if so what was the experience of the medium involving derivation and rules?

Well I not really, when I was most enthusiastic about this in the 1980's then, in fact I had no access to any computing power at all. So all the experiments and ideas were entirely explored on paper. Although one was very conscious that these would reach their potential in computerama but nevertheless you could play with them on paper. At that time, I am not even quite sure now if there is, a functioning shape grammar program that you can get and use and I am not sure if such a thing exists. But it certainly didn't exist then or I couldn't come across.

I spent quite a long time writing a very simple shape transformation program as an extension to Autocad which had shape replacement rules as part of a Autocad environment. I called it ERIS, it was Elementary Rule Interpreter for Shapes, and then when it was developed, IRIS, Intelligent Rule Interpreter for Shapes but it never arrived at the IRIS stage it was always stayed at ERIS. It was very crude, but it worked, and it was great, you could actually show people, that you could design a building through selecting rules without having to draw any lines and it worked.

So you could use a CAD tool to create designs without actually drawing a line, you just select rules and because it was part of a Autocad environment you got an Autocad design, the data base was a series of line definitions, part of which you defined all of which had been generated by the rules and I wrote a few rule sets for that and played with them. It was really no more than a demonstration system but I thought it was great to actually do it because it's all very well knowing that you could do it but actually do it is nice. You press a button and the thing changes in front of you and you could play with it.

Has this work been published?

It's been published a little bit in obscure places but I tried to run it for a long time. I thought I was on the brink of selling it to a client at one point who was involved in speculative development office projects and this firm had a fairly standardised building type based on a

square structural grid and their buildings were so many bays that way and so many stories and it was a fairly standard system and that system I could very easily put that into my system and it would work very well. The idea was that if you had a development opportunity you came across a site. What the guys did was spend ages with bits of tracing paper, tracing these 8 x whatever it was metre square bay grids, they wanted to see how many buildings you could fit on it and what the relation from one to another was. They had layers of tracing paper and they would get less and less accurate as they traced over and over.

All I needed to do was to put the site plans in as an Autocad drawing and on the site you just click, click and the buildings would just be there, absolutely to scale, precise accurate drawings. So for a feasibility study you could produce, precise feasibility drawings just like that. All the bays would just sort of add as you clicked on the screen and when it went over the site boundary you could backtrack a bit and shunt the building around, and they went broke.

I thought that was a goer but the company went down, it was in development boom they were working like fury in the late 80's and they crashed. That was great, it was doing an absolutely simple task of laying out 8 x 3 metre bays whatever they were. The tool was the there it would just make the thing quicker, easier and more accurate. So I think you don't have to be finding a Michelangelo to see some use in these things. It's perfectly legitimate to do simple things with these tools it doesn't have to be the pinnacle of architectural design to see a role for these tools.

Are there any artists/designers/architects you can think of whose work you regard as particularly grammatical? Perhaps you could name one or two.

The architects who were studied in the early shape grammar papers by people reproducing existing styles, Palladio and Wright people like that, they were obviously so effective.

What comes across is the proposition that some works of art have a grammar and others don't have a grammar and people focus their attention on artists whose work appears to be grammatical. That seems to be a kind of principle that you could use to try and discriminate interesting from uninteresting grammars, and an example of a fantastic interesting grammar or seems to me to be very impressive anyway, is the work of William Latham who had a set of rules for transforming objects, he was really trying to make a sculpture, so you start with a cone and then you can scoop a bit out and add a bit on, you can make a bulge, you can cut it, there are I think about half a dozen transformations, very simple geometrical transformations of this kind. But by repeating the transformations and doing a sequence transformation you get the most phenomenally rich and complicated and quite bizarre and fascinating forms out, the sort of things you

could never conceive of having been dreamt up other than by that route. They are so strange and exciting and there are thousands of them, millions of them, and William Latham does these most spectacular drawings of design branching from a little, very simple cone and as you apply rules you get a page of absolutely wild funny shapes, but they are not random they have a kind of a structure, you can see these sides have lots of scoops and here there are lots of bulges and that landscape of design that's come out of something so simple is phenomenal and that you say gives him a creative tool, nobody could ever have drawn that design and that landscape other than through those tools, its inconceivable.

More current examples?

So putting those there is kind of the monuments of history. Well these HKPA firm, the practice still exists, although I think it is not quite as exciting as it was, is a current example.

Would you agree with the statement that "design is computation"?

Yes, I would tend to agree, normally you would have to define exactly what you mean, in principle that is an act of faith.

Could you explain how you would interpret that statement?

When a design is emerging through whatever process, that process isn't magical. There is something at work in order to produce that output even if the people who are producing are not themselves conscious of what that process is. There is something it is not a magical thing. If you wanted to model that process either as a scientific observer or as a way of trying to learn how to do it yourself, you have to make that thing which designers themselves may be unconscious of and you have to make that explicit in order to understand and learn from it. The way you model that would be through some form of computational mechanism. So that in itself may be some what of a metaphor. Because you build a model of a process, the process exists, you see a design and there it is, it is a phenomenon in the real world and you are trying to build a model of it. But that model must be a model of computation, I don't see quite what else it could be.

How do you distinguish art from design?

That is an interesting question and when that distinction arises I always say I am not an artist, I just back off from that and the kind of design which I would say that I was focusing on was a design which had some purpose and there were some criteria by which it could be judged other than the satisfaction of the designer who created it. So if you are a designer who is working for society in some shape or form, it is society which is ultimately the judge not you and my sort of guess is that if you are an artist that actually your judgment is what counts and if society rejects it that is entirely a separate issue.

You are not designing, as an artist, you are designing for yourself, as a designer, you are designing for society.

Can you name an example of a design that you would regard as a work of art?

In the architectural sense any design or any good designer can be viewed as a work of art. It always has a function in various, the thing with architecture is that there is so many different levels which function simultaneously. A building in Cambridge which is a sort of classic which demonstrates the different levels and shows the conflict between them is the James Stirling History Library building which is functionally a disaster and the people who use it hate it, it leaks, it's often too cold, it's noisy, on every functional level it is a catastrophe, too expensive, very hard to maintain and so on.

But on other levels it is a phenomenal achievement, visually and spatially as you move through it and so on and the way in which materials are used, you have to say that guy is a genius. But for the people who live in it he was a disaster.

But isn't that an engineering problem rather than an formal architectural problem?

You can't separate them. You have one thing which if you use as a point of view may be successful from one point of view and disastrous from others. Of course in an ideal world you are trying to achieve everything simultaneously. I suspect it may be inevitably true that there is a trade-off and somebody whose commitment is entirely towards what one might think of as the artistic aspects of architecture, he may be forced to sacrifice some client requirements and that is throughout the history of architecture. You know Michelangelo wasn't very popular with his clients and how anybody could say what the right trade-off is, is impossible. I think you can see architectural designs have an artistic level and that can end up conflicting with function.

Thinking about the origins of the grammar approach, and thinking about Chomsky's work and thinking about how the natural language work that Chomsky did, maps onto visual language. Is it a good fit, is it mistaken analogy, can you equate phonemes with visemes or some atomic sort of understanding of visual language or is that all a mistake to try and do that?

It is a very powerful analogy. As a stimulating analog, it has merit. How far you can usefully take it—I am sure like most analogies, it breaks down after a certain extent. You are dealing with different problems obviously they have common features and you I am sure you couldn't apply all of the language theory to visual language. But I am certainly not sufficiently knowledgeable to say how far you can take it, but I would certainly think it is a positive analogy and a fruitful stimulus and I certainly wouldn't say it's irrelevant and perni-

cious. I mean the opposite, I would say it is exciting and stimulating but that is not a very technical level of response at all.

Thinking about complexity and a choice of lexicon within rule based grammar work: Could you possibly have a work in the visual language that was equivalent to the impact and power of a Beethoven symphony?

Those things certainly exist but it's a question whether they would be created by explicit rule based systems.

The idea is of course in music is that you have systems which are clearly labelled and understandable, in visual language it seems to be more difficult because the elements don't seem to be as detailed and well understood. So taken that that may be the case, what do we need to do to get to a point where there clearly is a way of building a very powerful visual statement like a Beethoven symphony using grammars?

Well, I don't know. I think in a way I would tend to back off that question, and say that if you were testing a new technological system, it is only fair to start off testing it on simple problems not the most complicated problems. If you were writing a hand writing recognition software you wouldn't expect 100% achievement. You would expect people to start with people who write clearly and boldly and then as the system got better, you would deal with people who weren't so accurate and precise. As a consequence you would eventually get to the most difficult scrawl and illegible handwriting, when you get a new system you wouldn't say it can't do this therefore through it away. But that is the last test not the first test you would apply and therefore to say that this rule based system isn't as good as Michelangelo is rubbish. It doesn't seem to be a sensible approach to an idea which is in an early phase.

In one sense I would back off the question and say it is not a fair question but still in a way it is a fair question and you say well can you envisage it ever achieving that and well I don't know. It is speculation, I can't see why not really.

Some people think that a Jackson Pollock would be an impossible thing to make a grammar for, do you agree?

I wouldn't have thought so because there is a higher degree of randomness obviously in that. With selection and I would have thought that you could do a pastiche of Pollock quite easily, you could make convincing pastiches. In terms of using grammars to replicate existing languages and design, you are talking about making pastiches which are convincing. If an expert can't tell it apart then you have succeeded and that is what the *Prairie House* exercise is doing. It produced new prairie houses which if you produced them on a dusty calendar and old paper and said these are here ones which are undiscovered and you showed them to all the artists and they said

yes, it is the genuine article, you couldn't do better than that. I would have thought you could do a pretty good pastiche of Pollock.

Do you think it is possible say, to encapsulate ideas that people have about spirit, soul and otherness in a for example a Rembrandt? Some people talk about the capturing of the "soul" of the sitter or the person being painted. Does that actually follow formally from an analysis, say of a Rembrandt series of portraits?

I think so, my reactions is that these terms are simply labels of things that people don't understand but actually there is a mechanism behind them. And it is a matter of skill rather than of some kind of mystical source, the result comes from skill not through some mystical process and I thought in principal that could be analysed and that skill could be discovered and replicated. I can't see why not, I can't see what barrier there is, although obviously the more the trickier the thing, the more subtle the thing, the harder it is. But I can't see in principle why it is impossible.

Some people would say that if you can't see it you can't compute it.

That is interesting yes, but there are kinds of levels aren't there. I heard this very nice quotation where I went to a music lecture and the lecturer was saying "There is a point of view what you can't hear isn't music, if you can't hear it, it's not music".

The sounds of silence.

Not just that, but what you hear is based on structures, I mean like the Beethoven symphony, you don't hear the structure which generates what you do hear. The structure in a way is the impact which comes through but is on a level above the notes. You can't hear the structure explicitly, except you do hear it through the realisation.

About otherness and spiritual communication, that invisible....

If they are capable of being communicated there has got to be some substance, and if there is some substance then you can grab it.

Do you think a grammarian has an extra awareness of the depth of structural relations say due to the experience of looking at relationships?

Almost certainly not, no, I don't see why that should be true at all. You can use rules, grammars to do the most banal things, drainage layouts say, and so a skill of grammars doesn't, it depends what you use it for and it doesn't give you tremendous insight, it is just a way of meeting goals well.

Some have said that when you start thinking in terms of rule based systems that the world starts to appear a different place. Everything starts to look as though there may be some hidden order or some mechanism that is discoverable which changes

your awareness and understanding, your mindset is changed by that experience. Do you feel that that is not true?

No I think that would be true. I think that in a way is no different from viewing the world from a sort of scientific perspective as opposed to treating it as a God given mystery. When you start saying why is it like that, how come and what is the cause and effect why is it sunny today and raining yesterday?

As soon as you start thinking with a mechanism why differently then you will see the world differently. But in a way that is not unique to grammars much you see, once you start to analysing design. It is like a layman: to a layman a design appears, it is a complete mystery, somehow it just appears complete and the fact that there are all sorts of quite straightforward requirements which cause things to happen the way they do, a lot of people would look at a wall and don't know in fact if it is a cavity or solid wall. They look at it and they just see the surface they don't think what is part of the surface. You can live in the world and only ever through your whole life look at the surface and never think what's happening behind it, why is that. But it may not be very difficult, it's not as if it is tremendously hard to understand what is behind the surface but you may never even trouble to question it.

So looking at the world or looking at designs from a point of view of grammar could have a very tremendous impact. Everything you see, you see differently. It seems quite possible that it would be true, but I don't think it would transform you into a higher being! It might make you less more in control of what you are doing, you'd be less at mercy at things, you would have more control over things, you understand things and understanding is a very important way of operating effectively.

How would you convince someone to actually pay for a grammar like ERIS?

That is a good question. We tried to wrap this thing up as a mechanism by which designers could understand the production process. When you design a building you always think of it when it is finished. The drawings you have produced are finished drawings. You never do drawings of half a building as an architect. You always can see it as a finished concept, finished object, and then you pass it on to other people and then they have got to disentangle it and build it up again.

We thought that it would be of value that people could see the process and that they will pay money to work on the idea of building, a model of that construction process, at a very simple level. The designer could play with it and make it so simple that it became part

of the design equipment.

Anyway we didn't actually sell it and I am not even sure it would have been a good idea, but it was a mechanism for launching work in that area of transformation rules.

Artists that produce the most are often predominantly rule based. Have you have been more productive because of rule based grammars?

It depends on how you put it. For example I picked up at a second-hand book shop, a book on how to write a novel, some instruction manual and of course you read novels and you never really think what tricks this guy is playing to keep my attention. You read this manual and think "That is how it is done!". You never think of how a novelist writes it. He seems so clever because he seems to have a talent for it. You realise actually that it is craft and if you know the knack, that isn't all there is to it.

Thankyou.

Neil Hanson: Interview by Dean Bruton

Lawrence Neild & Partners Architects, Australia, Sydney

14 October 1996

Neil Hanson is a Director of Lawrence Neild & Partners Architects. His Masters thesis *Living on the Edge* studied the shape grammatical aspects of Glenn Murcutt's architecture.]

How did you become involved with grammars in architecture?

In another previous life, I worked with Tony Radford at Sydney University where I did my final year, sixth year of architecture. I did a thesis called *Living on the Edge* with Tony, looking at applying Glenn Murcutt's work to work with computers. Tony and I co-authored a couple of papers on that shortly afterwards and since then I have done nothing on it all. That was ten years ago now and for those ten years I have been at this here at this practice. I joined shortly after graduation. As it happens the practice here is strongly rule based. *Grammars* is probably not the right term to use, but we have a lot or rules that we adopt for ourselves here. They don't apply to computers but they apply to design. But that is not why I came here, interestingly enough,— I came here because I admired Lawrence's work and he was one or the two or three people I wanted to work for when I graduated. But as it happens one of the reasons that I admire his work is for the rules that we use to create them.

You haven't done much work with grammars as such but have you developed a set of rules that is consistently being applied?

Yes, it is hard to describe it but yes we do, we have a set of rules that we apply to every design here. I really don't know how I'd put those into a computer if I was asked to. I describe myself as a modernist. I think modernism has more rules than postmodernism ever did. Postmodernism had a rule that was: ignore the rules. Modernism has gone a long way because of postmodernism in simple terms. We use the simplest rule of all of modernism is that: form follows function. That is a rule. It is broad one it is a wide one but it is a rule that I adopt here, in that we expect our buildings to show what they do and we expect them to demonstrate why they do it and we expect a learned observer to look at the building and work out a bit about them just from observation.

It is particularly so in cladding a building. We have a term Lawrence has used called a narcotics of pattern. What normally happens on a skyscraper in the city is that the pattern on the edge of a skyscraper in the city is there for why?,—no reason at all. It is purely aesthetic. But to us it is not a reason to do it. It must have another reason, you

must have a reason for doing whatever you are doing, that reason can be because of what is in the building, it can be because of the urban rules you are trying to accomplish within the city, it could be a whole lot things, but there has to be a reason for it. Given that one simple rule that tails off into a whole of others and how we can document, how we detail. A particular material, for instance in detailing terms needs to be expressed truthfully—that is a rule.

If you use brick it is load bearing material, or you show it so that it obviously not load bearing as a cladding. You are being faithful to what a brick can do but there a number of ways of doing it. We've have done bricks that are in panels that are obviously pre-cast and got a frame around them and have bolted them on the building, that is one way of using brick and that's fine, the other way is to use them as a true labouring material with true lintels and arches, whatever. Now that is a brick an aluminium curtain wall has the same demands. How do you express to an observer that it is actually built out of aluminium curtain wall?—One way to express the thinness of it. In a building I did in Canberra we took the edge of the curtain wall past its structure so you could see what it was made up of at the end of the building.

What was the building estate called?

It was called *Mont Street Offices* in Canberra. We used it to show them the beauty of a curtain wall is it's slickness and shininess and its newness. It is like a motor car body, so we tried to make that as much like a motor car body as we possibly could so that the person watching it could see that it is an applied skin. It is very thin down one side of the building.

Are they any other obvious rules that are consistently applied?

I think that that one thing about being true to the function of the building and true to what you are doing in it and what your building intends leads to a whole lot of other rules if you like. Hospitals for instance, there is a lot more to hospital than a dreary old building. Lawrence is responsible for some of the very early interesting ones which is Mount Druitt, which is a building we made like a snake basically and that was developed around the idea of having wards going around the central nursing that kept a lookout over the wards and then a central street that divided that from the rest of the hospital guts,—that is the operating theatre all of the other places that were in the hospital. All of the things that make it work, so the planning in that case pertained greatly to what the building was going to look like, the planning was dictated by how a hospital works.

As you may know I am less interested in grammars as a means of representing design but I am interested in the concept of grammars and the process of making design especially reflective practice, so how does reflection come into your work and at

what stage do you catch yourself reflecting on rules that you are working with.

Most of the time. These rules that we set ourselves here can always be broken—that is when you find yourself reflecting. You find yourself wanting to do something because it will look good, so it might not fit the rules adopted might not fit our grammar and that is when you think, you have got to then ask yourself what is the basis of the rule we are using here. We have had cases for instance where we wanted to have columns on the outside of a building to make that colonnade on the street and to hold up the building above it, We know that the building above it doesn't need holding up. Now in the end the columns went, but for a while he columns were there and they were being rationalised or we could actually make them fake.

They are not actually holding something up but we wanted them for another purpose—what do you do? Why do you want the columns? Is it just because it looks good or are they serving another purpose? Are they actually answering a rule that is strong enough to make you do it? We did one in Ward Street offices building in Canberra. There are two giant beams that run across the front of the building that are twenty two metres long and a metre and a half high by a metre thick. We were putting our building against another one which had these two beams and if we extended them we could do good things with the street and make a large entrance to probably do everything we wanted,—but we didn't want to build them. It was a long way up in the air, this was a design and construct brief, the developer didn't want to build it.

Why should we do it? In the end we did build them but we built them out of polystyrene, believe it or not. We discovered that there is fabric called Insulclad which is polystyrene and then it's got reinforcing put on the outside of it, plastic sheet and then it is covered with the cement and when it is finished it looks like concrete but it is actually polystyrene. It is as light as anything so we made twenty two metre beams out of polystyrene up in the air on a metal frame.

But being true to ourselves and true to our rule making we stopped them that far short of their supports and put in very small pin supports so that when you are looking at it,—the glance is oh yes that is concrete because it looks just like it you can't tell that it is not concrete. But then if you look closely you can work out that it is not actually being held up by anything more than a couple of single bolts. That is meant to lead you into the idea of why it is there and what it is, so it may appear fake and yes it is fake and we are showing that it is fake. But it does what it had to do which in design terms for the urban response with the street and all we wanted the building to do it was important that it happened.

This idea of reflecting and then reflecting on the reflection, it's like going back over again.

That is the way it happens,—you go back over and over again and because everybody in the office takes a point on which they decide to abandon the rules if you like,—that happens in any design thing somebody might want to say "That is okay but we want to get to here, throw it away, out the window, let's just get there", others might say "No, I want to take it further. I want to make sure it works". Everybody is an individual and everybody varies in where they want to stop and how stringent they are in applying it.

I met Glenn Murcutt and asked him about your work with him. I asked how important, or relevant shape grammars are. He said it is okay for previous work that you want to identify/analyse but not for future work.

Yes, he doesn't think it points to the way of the future. We had a great conversation with him about that. He uses an analogy of ten parks. When he was lecturing at the University of NSW he set his students to design a park. One of his students had looked at the history of parks and ten other parks in the city and gone through it all and bought it in and proudly showed it to Glenn who said, "That's all very well, but where is the next one?"

That is what Glenn wants, he wants the next one. The fact is in his work it is informed greatly by what he has done, there is no doubt about it. Most of us who build up a body of work or build up a body of knowledge whatever apply the things we learnt in the last one to the next one. He definitely does in his buildings and you can see them, they just grow out of the last one. It is all just getting better and better.

Did you come to that awareness because of your work with shape grammars. Do you think it develops your understanding of structures?

It definitely does. I haven't noticed how right that is for Glenn until we started doing it. We spent a long time and so we poured over the plans and we compared one to another and put them out in order that they were done and the more you looked at it the stronger it became. The more you talked to him the stronger it became. Everything he has done he has thought about deeply. I think he is still, I haven't talked to him about this stuff either except in passing but I think he is still wary of computers. He always has been and still is. He is out there on his own doing the work he wants to do and he is quite happy. I don't think he wants to admit that computers will ever be able to help as much as we think they might.

Do you think computer grammar interpreters will contribute to architecture?

Yes I think they will. In my own case if I hadn't done that I wouldn't know much about Glenn's work or formed some of my own views. I thought it was quite important.

Can you name some architects/artists/designers who work with fairly strict rules?

DCM (Denton Corker Marshall), they have quite a strong sense of rules especially in their high rise work, a very strong grid analogy. They're rules are very strong in everything they do. Phillip Cox, I see a great sameness in his work but I don't know whether that is because of rules or not. I haven't looked at it closely enough to interpret that but I see a great sameness except for the Casino I suppose, but a lot of his stuff is very like the next. In DCM I see a set of rules but each building does not look like the rest.

On an international level?

I admire Foster and Rogers for their push of the technology of building and especially of pushing the wanting to show the buildings that we do now as new buildings, not old buildings. That is another rule that we have here. I suppose we got from them cause we do a lot of alteration work. All architects do. What we do is alteration to another building in many cases, we wanted to make it to look like it was built today, to be new, not a copy of what you have just done, one that was done ten years ago putting it next to it to make it match we want to make it look like it is here and now and new but it should complement what it is going against. It could be completely different as long as they work together.

I am interested in the contingent sense of grammar when rules appear to be used, when they change, when there seems to be a sudden change in a derivation and how much rules appear to carry over from one work to another. Are there any examples perhaps where you can see a change in a derivation?

It is interesting, you learn all the time the experience from one job to another—but whether it changes the rules you are working to or not?

It is almost like designing backwards isn't it, it is like getting somewhere and trying to work out backwards why you are where you are. We have done a couple of things that people think, "Does that fit, has it been built or finished?"—but it appears to work and it works, but does it follow a rule or meant to be a new one or...? Certainly we hadn't planned on doing it when we started the job.

I think the best way to talk about that would be to give a couple of examples of instances where we had to introduce new rules or looked at a project when it was finished and said does that fit the rules we had when we started. The cement beams, we had no intention at all when we started with the project of doing anything like that. We wanted those beams up there and we always intended that they would be in concrete and we had columns to support them and we got further into the project, we wanted to take one of the columns away, it was just too big and in the wrong space and we

discovered that the money we had in the foundations to support the columns to support the beams was quite a lot of money and was only there for our architecture. Then we decided to make it. We wanted it there we knew we wanted it there, we didn't want to put a load on the columns, so we came up with another system.

Having done that and then working out a way to express it properly so it did hold with our rule set. I think that it did change the way we looked at a number of problems since then. The three or four problems since then we have considered building things out of fake materials which we would never have considered that before. That *Ultimo Community Centre* we actually considered doing the same thing in columns outside or another material like that. Columns that look like they are supporting the two storeys of structure that didn't actually support. We considered putting them in anyway and showing that they didn't support.

Secondly, the *National Science Centre* in Canberra has got a drum in the middle of it which in the middle where the footings had been poured it was halfway up what Lawrence redesigned the top of it. It took about a month I think and by the time it was finished everybody except for Lawrence was wondering what the point was. It is a very interesting one to look at. I was a junior on-site architect on the project and so I saw what was going on and it was interesting what was happening. I still can't see the value in having done it because the changes were minor.

To Lawrence they are important, to me they are not as important. It has got a tile floating around up the top cause it is obviously applied tiles and it has got a cornice around it, decorative and you could say you could put satellite dishes on it or something like but that particular part of that building really questions whether we satisfied the rules for that building or not, cause the rest of it is so easy to see why the rest of it is what it is and it's six cubes and one of them has been taken, two have been deteriorated to get it flowing and in the centre is a drum, and the drum is that way because of the circulation around the museum. You go around this great ramp and you go up and down and each of the cubes is in the Exhibition Hall and you go through the Exhibition Hall and it's all the just there it's all obvious why it is there.

What was the basis of the change of decision about the drum?

I don't know.

You worked on the original design?

We have got models of the original design and it's similar, it is not the same but it is similar. There was one drum which was two drums coming out of thing so the circle of the area that was taken up by the ramp was expressed on the roof as two drums. You could actually walk up onto the roof to the top and look out to the view so you

have an outer and an inner drum. That was done away with and the one we have got now is a tall drum in the middle on to which the ramp is fixed and the cubes pushing up against the side of it forming the other edge. We got to that fairly early but then the top changed, the top had windows that openings that got smaller as it went up so you could see the ramp extruding itself up to the top of the tower, that vanished and the openings all around the top half were perfectly symmetrical, all the same size.

Now I like the idea of the things coming up and it seemed that the formwork for the ramp, the format for the drum was made as a spiral, so you could see the floor spiralling up and in a way it makes sense to see those openings getting smaller and smaller to the top. Lawrence chose to make them all the same at the top so the things driving that was the view of the building from the outside. His view was the top of the tower, the top of the drum is driven by the impression one gets from outside the building so it is important to have everything symmetrical and looking right and the fact that from the inside is actually carrying around the thing is not as important.

As far as contingency is concerned how did this affect the follow on?

Yes, think it has,—that was the ultimate example of changing something. I questioned that because I wanted that stage to say that the overriding rules is that what you are doing should be driven by what it does. Lawrence is saying "Yes, there is that but there is also what the building is from the outside", which has another set of rules is another design generated if you like.

I've come to accept that and I agree with that completely now so that and this is where I always get into the office always has its most interesting discussions because what drives the building from the outside can very easily break down into pure aesthetics and it is difficult to make rules for aesthetics. It is difficult to make rules for urban design and what a building does on the outside. It is much easier to let the inside control the outside, when you get to the outside the influences on it are much more subtle. It is much harder to do and that is where people can say "But you are only doing that because it looks good", that is the ultimate criticism of a rule I think.

Perhaps now would be a good chance to ask you something you are working on now, could you perhaps relate that to some of the discussion about a contingent sense of grammar.

Yes, I could probably show you something we just finished this year. This is the *Australian Graduate School of Management Extension* at the University of NSW. We opened in February this year. This is an interesting project because it has an existing school over five levels. We have a residential attached all done in 1970s designed and construct

in cream brick, a terrible building. The brief we were given was to add something like this [draws a sketch] basically five levels to give them their accommodation. The problem with it all was that this in the beginning was a nice area and we had to make this a nice area again and the Dean's brief was to make it a memorable space. So we concentrated the whole thing on a courtyard and what we did in the end was to do a curved glass wall and then a brick wall curving in so that all of the focus of this building was on to this courtyard,—not to there, if we had done a square building the focus would have been to there and a lot of various other things, a fountain here, a pergola around here as you can see in that photograph.

All of this design was driven by the needs that the building had. It was to house students, three levels of student accommodation and two levels of administration. So immediately we split the administration into a long rectangular block at the top which was made up of offices along a central corridor, your standard university building, good natural ventilation, corridor down the middle, doors are standard off the side. That led into the other two floors over here. [showing photograph in *AR* journal] You can see that the verandah sweeping around here, the office accommodation, the same thing is here, see the office accommodation going through there, up above the other stuff down here. The other thing is that we made all of that, all of this is clear glass for instance because we wanted this to be a major circulation route for people to be able to see in and out of the building.

One of our rules is to make buildings simple and easy to understand and to show how people get around them so the glass to the central circulation zone which was here and on the left and all of this was all clear. Whereas other glass in the building for example the glass on the windows of top of this thing is tinted is because you need tinted glass in office to cut down glare from computer screens etc. So that is how we choose what type of glass we use.

We want that glass to be clear because it is a circulation zone, we want people to see in and out but it also faces north and east, so because we used clear glass we then need to put on the outside of it sunshades to keep the sun out. They are automatic sunshades that drop when the sun is there, and then their is a pergola on the level above that which has got vines painted on it that will grow thick in summer to show the ground level. So we gave them clear glass so people can see in and out of it and then we shade it to keep the sun out of it in summer. The alternative could have been to make that reflective glass and keep the sun out and that would have only served one purpose, one of the three or four that we wanted to serve.

The detailing through here is also of interest because another rule that we built up here just in detailing is that we don't use a circular steel section very often in fact we try to use steel to express the forces

that are used within the steel. A circular steel section is good as a tube or good as compression or tension. You see a lot of tubes used for truss members or whatever.

The thing about a circular section is that it is the same depth and same visual weight wherever you look at it from, I mean the base of that tripod it doesn't matter where you are looking at it form it is always the same size, the flat or the angle changes as you around it because you have some extra interest out of the structure. So all of that steel in this area is all made out of flats or angles or whatever and they only but we used circular steel columns, we used pairs of circular steel columns to hold it all up.

This is an example of Lawrence changing his rule set as well because he would naturally not do that he would avoid thick steel at virtually all costs We put this in design and he didn't see that until it was built and he came back and I heard him say to somebody, "Never use circular steel sections—unless it like the ones we used at the AGSM." That was good. It is true to our rule set to use them in that manner because they are a column purely on a compression but nothing else in that whole steel section was circular. I think it is easy to adopt a rule like that and to take it too far and just naturally think I can't use it whereas actually you can.

I think every design is full of examples of applying rules like that. If you notice on here the third level of this three level courtyard wall here is an open deck, it is basically an open deck so that is like a verandah. Now we wanted that because it gave the right scale to the courtyard. When you are there you know that three storeys high is the right height to have it, the existing building is a little bit below three and it just works around it, it just feels right—from a courtyard perspective it feels right. When we did a few designs with that glazed in but with a three storey wall here it wasn't right, from a courtyard point of view it wasn't right, there wasn't enough scale and definition there so we chose to have this open. Now the fact is there are offices at the back here, and the only way they can get there is by going along this verandah. The library is on that level also and the library can only have one entry and exit to keep it secure and that's in another place. So these people have to get around the library on the outside here. If there is any weakness in the design that is one of them, that is because we chose to and I think rightly decided that the image and the feel of the courtyard was more important to that than giving these people the way to get to their offices indoors.

The Dean agreed with us because we discussed that with him and his design community but the people who work there don't agree with us at all. I heard one of them showing one of their guests saying "Can you believe it, we have to go outside to get to our offices", and so I think I would rather deal with some other solution to that but

there wasn't one. And we just chose one way over another if you like.

How do you see the place of grammars in making new design as a loose analogy and as a formal system? Do you agree that there is such a thing as a loose analogy of grammar or is a grammar always really formal.

No not really, especially not in architecture because I think if you interview everybody here even people who worked on this project with me you would get a different, I think some of them wouldn't say there isn't a strong set of rules driving it, where I would say there are. I think a couple of us would hold to that and the others would be more on the edge understand where things are coming from most of the time but if you asked them to give you a set of rules that they thought applied to this I think you would get a different set of rules.

Would it be an advantage if all the architects working in a practice all have a good grounding in shape grammars?

It might help, certainly it is extremely helpful to state for people working with you what your set of rules are, most of the time it is just conveyed from one person to another by looking at a problem it is not often that you sit down and say well "I believe in this and this". I still think that is one of things about design—I still don't think anybody has defined it completely. I think we all do it slightly different and you still couldn't write down how I design. I can write down, the older I get the more reason that I can give for the way I do things.

So a mature designer knows there rules more.

Absolutely.

And articulate it more?

If you haven't got a set of rules to design by, where does it come from? If you haven't got a set of rules that you build up over time where does it come from? It can only come from, it only comes from visual image in a magazines or it might come out of the back of your head or somewhere or whatever. Design can only come from experience and knowledge.

So in the end you think that shape grammars could contribute to art design education.

Yes, absolutely.

Do you think that there is a place for grammars in making a new designs.

Yes, absolutely.

Perhaps you could distinguish between the loose idea of grammars and the formalist system and perhaps how either of those

could contribute to the making of a new design.

What do you mean by the formal system?

Formal algorithmic systems say, when you "Choose your algorithms and let it run" would be John Lansdown's way of putting it.

I would find that difficult to produce a design that way. It depends how wide ranging and how much you allow your algorithm or your computer or whatever it is to think. This was what we were kind of doing with Glenn Murcutt stuff wasn't it. There isn't a computer that can do but if it could then it could do this, it could help Glenn Murcutt design houses by giving him something to think about each time but it wasn't at that stage and I don't know whether it still is possible to actually do it

So it has been ten years since I looked at that stuff so I just find the design something like this is strongly rule based for me, for us here but I don't think I could feed that into a set of rules that would produce a shape. I don't think that I could get any design out of shapes.

What would you say the reason is? The reason is because you would have to reflect?

The reason is that the rules that I use or we use are loose at the edges I suppose. They are flexible and sometimes they get abandoned, whatever and as we have been discussing we might make a new one. They are not strict enough to write down yet. It might be something to do with the work that we do as well. The work that we do is often,—it is not like there are three projects that follow each other in the same kind of thing. We do a lot of libraries now and they have a set of rules of their own which are interesting. We have always done hospitals which have a set of rules of their own. We do university buildings and they may or may not be libraries and they have a set of rules of their own. If we were doing more residential work, more towers for units—that is getting close to something you could see—I guess the floor plan that we have done for large residential towers it isn't long before you come up with something that you have seen or done before or whatever. Something like this is a little bit looser. It has the general rules but we have never done them like this before.—How do you do that? is the question.

Does the reflection include a fairly high degree of personal, hermeneutical understanding is what I am trying to get to, the idea that there is a deeper sense of self creation happening during the creative process when you are designing?

Yes I think you are right. You know how I said every design teaches you more. You learn more from every design so everybody is working on getting something for themselves out of doing things and designing and creating whatever it is and that isn't the same for every person—that can be different.

What is the most satisfying moment then as far as your career goes so far, in the sense that you feel happy with personally that satisfied all the rules for the firm.

I feel very happy with this one, even though it didn't win an architectural award. The other thing is that the older you get the more influence you have on a project as well or that the ones where I have been here working under someone else learning the rules if you like you don't feel as great a sense of satisfaction when you come out of that because you haven't been driving it. This one and a couple of others I have done recently I have been driving and I get a great sense of satisfaction from that because some of those are my rules they are not anybody else's and to see it up and to see it work it is good. I've seen some stuff that I've done that hasn't worked but this one I feel very good about.

We are doing one in Queensland that is being built now, which I also feel good about, I didn't have much to do with that one but I was certainly there at the beginning of it and pushed it and whatever so it is not as much mine but I still feel it is going to be very good. I think I am managing to change, me and two or three others here are managing to change what the firm produces in a way. At Lawrence Neild, the buildings in this firm have always been different from they are quite different from each other, there are a set of rules that binds them together but sometimes you have got to look for that because they have different clients, different places, different types of building, they are different and we keep on doing that. We keep on turning out stuff that is different. I don't find it satisfying seeing the same type of stuff come up, I could not find that satisfying.

Are there any artists whose work you regard as particularly grammatical?

I actually worked with one artist here Jenny Turpin who is a water sculptor/artist if you like, all her work is bout the use of water one way or another and I think you would find it interesting to talk to her cause she takes the use of water a lot further than I would have ever thought of and so she did a scheme for here that was all just the sound of the water for instance, I thought is was fascinating she just got one thing which was water but water can do a lot of things. I have seen a number of her sculptures and they are all great. The fact that they are all based on water I think means that she has an instant set of rules that she has to work because water behaves in a certain way. I think you might find that interesting.

Janet Lawrence who did the new Museum of Sydney and she did the two and the *Tomb of the Unknown Soldier* in the War Memorial. I have worked with her and she is quite thoughtful about what she does and she is telling me that her art is about telling a story, they are all story lines.

Richard Goodwin who is also an architect does the panels on express ways and stuff like that, that is quite interesting. I think they are strongly grammatical because they all focus on one thing and so they have to have a set of rules to work with.

Do you find a rule base useful for working with other firms?

We are doing a building in Queensland we are doing in association with another architect, with John Mainwaring who is a architect who has got about four or five people working for him in Noosa. We did a library for the New Sunshine Coast University and he's a local architect who knows the local rules if you like and we know University buildings on the University libraries and we got together and won the competition and built the building and the experience of working with John has been very interesting. The building that we have created together is something that neither of us would have done on our own and so it is an extremely valuable partnership and we do that a lot now. We are doing, we are taking what we can give to a project and finding someone else who can give something else and working together to create it and it is very interesting, but to do that you have to be able to say what guides your work, what your design rules are and he or she has to be able to say what theirs are and you by putting them together you find that things are theirs that fit with your rule set, and that is what we have done. We have a lot of the same materials. He has wants to use it because he knows about the climate there. He has been working a certain way but it fits into what we want to do and it is very interesting.

Would you agree with the statement that design is computation?

If it is a lot of other things as well. Design is computation because you are always working things out and always comparing one thing and another and you are always looking at a number of options and you are always balancing and juggling that definition of design as being juggling seven plus or minus two balls in the air and you have got the solution when you catch them all at once. That is computation if you like!

If design is computation, do you think art might also be computation or is it something completely different?

No, I'd only distinguish it in the medium that you are using and the way you might change your technique because of what you have to end up with. I mean we are producing a building and in the end it has got to stand up and keep the rain out, it has got to do this and so there all those things but an artist doesn't have to do that The actual process of creating a painting or a sculpture or a building— I don't see a difference. We might have to ask fifteen nurses what they want

in their nurses station and the artist might not do this. I don't see a difference.

Would you nominate an exemplary piece of architecture?

I will give you two that I think are fantastic, I think Ronchamp Cathedral by Le Corbusier. I still think is one, for me it was the first building that I ever saw as a student after I had decided to do architecture. A building doesn't have to be square or flat or whatever, it took me a couple of minutes to work out that is was a building and I just think it is fantastic because it uses materials and forms and stuff in a way that I have never seen before and I think a lot of people haven't, so I think it does what it does extremely well.

Then a more recent one if you like the Nondacatsidis apartments in Melbourne near the Victoria Markets, it has been published in *AR* Australia. They are about five stories high and they go down a long block and they are speculative apartments if you like. They are down a sloping site. They are split into bunches of two apartments together and entrance on the road on each one. The entrance of each one has a different sculptured figure two stories high in green bronzy looking concrete.

There are tortured concrete balustrades and incredible steel balustrades, glass behind I can't even describe it to you more than that but it uses the materials in fantastic ways and it's a brilliant thing to look at. The scale is right good apartments to be in and I have been in a couple of them and I think it is excellent. I don't know whether it complies with my rule set or not because it is confronting to me because I look at it and I think—wow, and then it is the kind of stuff I never would have thought of doing, some of it I never would have thought of doing. I look at it and I like it I think it is fantastic so I haven't studied whether I could that or not in the way that we work but I think it is very interesting.

Thankyou.

Joan L Kirsch and Russell A Kirsch (with Scott Chase): Interview by Dean Bruton

Kirsch Residence, Clarksburg, Maryland, 20871-0157, USA

23 July 1996

Joan Kirsch is an artist and art historian. Russell Kirsch formerly, Director of Computational Research at the National Institute of Standards and Technology, Washington pioneered computational picture languages using grammars.]

Firstly, why did you choose Diebenkorn to make a grammar?

JLK The proximal answer is that we had a Diebenkorn reproduction on my icebox! But, of course, it was on my ice box was because I have always liked his work a great deal.

Richard Diebenkorn was a good artist to start with in terms of describing a composition. That is, at first glance, his work appears geometrically formal, which might imply that he works out everything ahead of time in a cerebral fashion. But Diebenkorn said (as do most artists) "I don't have a plan. I don't have rules." Yet, insofar as we can recognise his work so easily, he does have rules. And so this was the challenge—to uncover his unspoken rules. Of course there have been artists, such as Mondrian and members of the de Stijl movement whose work was deliberately governed by an explicit program which was not the case for Diebenkorn.

RAK Well that's right. And Diebenkorn said, "I am just painting it as it feels".

JLK The ways he expresses how "It feels" are his special rules just the same. That's the long answer to your question.

How did you manage to see his paintings?

RAK We studied his *Ocean Park* paintings chiefly from reproductions, which of course is inadequate, but it was the best we could do.

JLK Of course, there are plenty in museums, but not enough to do a whole study. Washington does have a lot of them .

RAK On the basis of looking at them, Joan started to put together a set of rules noting which things always go into a painting and even the presumed order of the compositional elements. Joan wrote a set of rules and I programmed them and wrote a grammar and then using the grammar we generated some Diebenkorn compositions.

Did you show the results to Diebenkorn?

RAK Yes.

What did he say?

RAK That was rather amusing. We sent them to Diebenkorn and then phoned him expecting him to say "Fellers, you just don't under-

stand all the process", but he said just the opposite. His exact words were "I had the shock of recognition. Those were my compositions". We were kind of disappointed, partly flattered that he recognised them and disappointed that he had no criticism for us, that is no constructive criticism.

JLK But he wasn't willing to work with us you understand, because he was too busy making pictures. Even though he knew that we were on to his style, he obviously didn't want to cooperate .

RAK Of course they weren't his real composition—we generated them on the Sun computer. What happened was, after we wrote the grammar, we gave it to a colleague of mine, Sandy Ressler, at NIST. Then Joan and I went off to climb the Himalayas while Ressler implemented the grammar on the Sun computer. Subsequently we went to a show of some of his new paintings at the Knoedler Gallery in New York and one of them, which we of course had never seen, was strikingly similar to one that we had randomly generated. That made a big splash naturally. "Scientist predicts art" and all that sort of stuff. But, you realise, we were only describing the linear divisions of his paintings. We felt that that Diebenkorn's handling of colour was the most interesting part of his work. But his colour was too complicated for us to handle.

JLK It's not only complicated, but if you're working from reproductions, you can never be sure of the colours. Reproductions of the same picture vary widely. And there are overlays of paint. Even to name a colour is impossible with such rich palimpsest.

Lionel March talked about the problem in the visual language that we don't have notation like we have in music.

JLK The nearest notation is a structural grammar. Well, there were people like Kandinsky, who felt they did have a notation,. If you used reds or used blues, or use greens, you would be projecting very specific emotions. Or if you used certain lines, and shapes, you would also be conveying certain emotions. So they did have what they felt was a notation, but it's been far from universal. Perhaps this was useful for the painters whose work was intended to be especially symbolic.

In your paper it seemed that your grammar was judged by experts and I wondered who the experts were? I imagined there were some academics in a university who were the "experts" on what a Diebenkorn painting looks like.

RAK There were only two people who were experts that we dealt with: Joan, and Diebenkorn. When we realised that the colour was the really important part of Diebenkorn and that was really too difficult to handle, as everybody, I think agreed, we decided to try work on Miro, for two reasons. First of all, his shapes are of course much more elaborate than Diebenkorn's rectilinear shapes (and represent-

ed a new challenge) and his colour is simpler. So we chose the set of 23 gouaches that he did in 1940, called "The Constellations". We started to write programs with a Macintosh to generate compositions in the style of Miro's *Constellations*.

What is the history of this work

RAK The original idea for this occurred quite a long time ago, in the early 1960s, when we were all doing work in mathematical translation of languages. People were very excited about the notion of writing grammars for language. This was the first attempt, growing out of Noam Chomsky's work, to be formal about a language that all the computational linguistics people were using. For such work as this, I was one of the fortunate people who had the use of SEAC, the only powerful computer around, which we had built originally at the National Bureau of Standards. It was the first of the contemporary computers in this country.

I thought that it would be interesting to see whether you could extend this notion of language to describe images. So I wrote, for the SEAC, what was probably the first picture grammar with regular productions operating on rectilinear arrays of symbols and generated a simple class of images like triangles. That notion caught on and it became a little sub field called picture syntax in the pattern recognition community devoted to writing grammars.

The grammars that people were writing were simply toy grammars and I thought, "silly things". But they were mostly theoretical undertakings to show you could write grammars.

And then something rather peculiar happened. I was about to propose to people that they abandon the field because it was going nowhere. One day, my son, Gordon, came home from the library with a free copy of *Books in Print*, a great big fat book about three years out of date. I said, "Why did you bring this thing home? Of what use could this possibly be?" I started flipping through it. And as I flipped through it, I saw something called *Algorithmic Aesthetics*, by George Stiny. Now you must understand there are tens of thousands of entries in here.

JLK I mean this is a really odd circumstance.

RAK Now what could that possibly be: "Algorithmic Aesthetics". So of course I did some telephone research. Then, on the phone, "Hello, Professor Stiny?", "Yes", "My name is..."

JLK And Gordon was vindicated.

RAK Yes, of course my son was vindicated! Well of course, Stiny and we became great friends. I was very much impressed with the kind of things that the architects were doing who were working with Stiny. So, when I realised that Koning and Eizenberg had done really excellent work on a grammar for the Frank Lloyd Wright Prairie

houses and other architects were doing similar things, Joan and I decided, "Well why don't we try something really hard. Let's see if we can work in the fine arts". And so that's when we decided to work on Diebenkorn and of course the rest has been documented.

SC This is about the time that Terry Knight was starting to do all her stuff too, I guess.

JLK Yes.

RAK Terry was a student of George's.

JLK And she was working on artists, Vantongerloo and Glarner.

SC I am particularly interested, because I didn't realise that there were computer programs written for all of this.

RAK The Miro stuff is not in fact, a formal grammar. It uses LISP code written by the world's oldest bad LISP programmer, me. What it does is give you the opportunity to try to create a composition by giving you various menus with continuously variable parameters, so you can generate shapes. But of course it forces those shapes to be Miro shapes. It then allows you to take these shapes that you have generated, that you think you have generated, and to drag them into a composition. And again it constrains you to do only the things that presumably Miro would have done. So the net result of this "trying" to be Miro, is it you create what looks formally like a Miro composition .

JLK I think you could also emphasise that it tries to approximate a process. Not only the shape, but how did you get to that shape. What would be the obvious way to draw a shape? I mean that's conjecture, but being an artist I know how people usually work and how people make compositions. I just make an assumption that generally artists work top down, though occasionally they get caught in knots somewhere, and that generally gestures are of a certain kind. That was kind of what informed how we decided the process of Miro's work.

SC This was a two part process. One to generate the shapes and the other was to compose them?

RAK You generate the shapes and then you have the option of dragging them into a composition. When you drag them into the composition there are some constraints. For example, in fact one of the only ones I have implemented right now is, that, when you drag a shape into a composition, there are some places you may not put it. And if you try to, the machine says "This may not be done, please move it elsewhere". But of course, if you drag a shape to a permissible place it remains. In this way, you build up a composition. At least, in so far as these constraints capture Miro's compositional principles, it becomes a Miro-like composition and of course from the pedagogical standpoint, its an excellent way of learning. To force you to do some-

thing correctly, is the best way to teach you what is correct.

Would you have liked to involve a reflective development of the process of building that program? I am thinking about Donald Schön's idea of the reflective practitioner. It would have been interesting to say to Miro "Are we on the right track?", and work with the artist.

JLK Yes, but, artists first of all don't want to do that, and of course both Miro and now Diebenkorn are dead. But even when Diebenkorn was alive, it didn't work. You know how it is. Most people think they have been inspired by the muses, they don't want somebody to assume that they have a plan, or that we know the exactly what's going on. Fine artists particularly are often very inarticulate. Actually, we also chose Miro for the reason that he, more than most artists, said he works intuitively, without rules. I mean his paintings are exquisitely finished, when they get finished, but in the process of working as a Surrealist, he would have intentionally allowed, and incorporated, "accidents, happenstance, unconscious notions", all kinds of things which made his pictures interesting.

So its pretty hard to get an artist to talk as he goes along. There are some people like those who posed for *Art News*. Oh, you don't remember, you're too young. A long time ago it was wonderful, during the period of Abstract Expressionism in New York, the magazine, *Art News*, ran a series of articles on artists who then became the most major painters in New York and followed them in the process of making a painting. For me as a specialist in 20the century art, I found it most interesting to see and learn how Jackson Pollock or de Kooning, for example, made a painting. And they did talk about their work as they went, but you know, someone was around with a camera all the time interviewing at length. This was not an analysis in the sense that Russell is talking about at all, but it was wonderful to see the process and to see how they scratch out and start all over, what got them disgusted, what got them pleased.

SC I'd be interested in seeing in particular if they were focussing on Pollock's splatter paintings, because we did one as kids with my father. My parents still have it hanging up in their hallway.

JLK Yeah, I know it became very customary in school to teach kids this way. Allows this kind of freedom of gesture.

Is there something about a Pollock that can't be captured?

JLK Sure,

RAK There are lots of things about Pollock that can't be captured.

JLK Yeah, a million things.

RAK Of course the most important issue is, how little we can possibly capture.

Did Diebenkorn say something like, "Sure you've got the struc-

ture, but you've missed the organs of the animal."?

JLK Yes, of course, I guess when we talk, I try at least to explain our limits because people will say "But you haven't gotten the spirit of the picture, you haven't got the meaning for heavens sakes"— those very things that keep people looking at pictures. There's no question about it, but still ineffable. So, we are going at really the most cold and formal aspect of the picture. But my contention is that you recognise a picture by its formal properties. You don't recognise a picture because it stirs up your viscera . You recognise it because of that splash, or those colours. You are recognising the formal qualities.

I've just come from an afternoon with Robert Venturi and Denise Scott Brown. I asked a question, "Is there a visual equivalent to a Beethoven and she wouldn't answer, but Robert said, "Yes, Michelangelo". He thought that you would stir the same feelings, equivalent to a Beethoven symphony, by looking at a Michelangelo (I think it was the west wall of the Vatican).

JLK Well these of course are very personal connections, but go ahead.

He seemed sure that you could have a visual equivalent to musical experience.

JLK I am not always sure, but there are times when a piece of art will stir me the same way. I mean as much as a piece of marvellous music, but even so when you're being stirred, you said Michelangelo, that means you had to recognise Michelangelo before you could even say it was Michelangelo. And you did recognise it by those bulging muscles, the twisted movement and any number of other things we could call formal properties. The point is, you might see a Michelangelo you had never seen before and still be able to recognise it as his work because you knew his style from previous examples. What you recognise were the formal properties of Michelangelo. So you can say, "Oh, that's Michelangelo, I never saw that one before. I didn't know he did that". I mean many people can do that, can't you?

RAK You can do it in music too.

JLK Of course, in music.

RAK Example, we were listening to the radio. I turned to something and I said, "That's by Sir Arthur Sullivan". Its a piece I have never heard of before. I didn't even know it existed. It was something called the "Merchant of Venice Overture", or something like that.

JLK And he was right.

RAK Of course, and purely because of the formal properties. The music didn't inspire me, it didn't evoke any particular emotions, but formally it clearly sounded like Sullivan and at that level there are

the analogies between music and the fine arts. But beyond that I think the culture is so different that that kind of comparison that you asked about can't be made.

Are there any recent contemporary artists that you could name, that you think are particularly grammatical?

RAK Oh, yes, Harold Cohen.

JLK But he's not really in the mainstream, you know.

RAK Harold was very interesting. I mean I've had a running argument on this for a long time. He is seriously interested in the formal properties of what constitutes an image and he has gone to the trouble, unlike most artists, of learning a programming language LISP, so that he could analyse what he thinks are his formal problems. And he's done very well with his programs. He produced figurative art, which is very difficult to do formally, because you can't separate the formal properties from the properties that you bring to the art. The interesting thing about Harold Cohen's work is that, as an artist, he has sort of abandoned fine art and he has spent quite a number of years now playing with a program. I tried to urge him to get a good programmer to do this stuff for him, so that he could concentrate on his very sophisticated understanding of the visual arts as an excellent artist, teacher, and critic. But, he doesn't want to do that. He became infatuated with programming.

JLK Well that becomes his new art form.

RAK Well of course it's become an art form for him. Too bad, because as an artist his new art form is not that good.

That's a very common phenomenon in the computer field and I must say, I myself have been responsible for a lot of really first rate people abandoning their fields, and becoming at best, good second rate computer scientists and computer programmers. It is a very infatuating art form and you have to be very careful not to get seduced. There are a few people, George Stiny is one, who are not easily seduced. He really remains fortunately hostile to computers.

I have spoken to Philip Pearlstein and his wife in New York and filmed his latest work and his exhibitions and spoke to him about whether there were rules in his work.

JLK Yeah, well it's very formal. And what did he say?

He said yes, that he has a definite method of a process of work he builds from his centre, there are rhythms, a unit of measurement that he uses throughout the entire painting.

JLK Based on the human form, or, some golden section or something?

Is sort of an intuitive thing, — he chooses the section of the figure.

JLK On those proportions, a module, I mean, he uses a module?

One single measure that he bases other measurements on throughout the painting.

JLK Interesting, I'd like to know more about that.

I went to the Larry Becker Gallery and spoke to him about artists who really have moved right out of the narrative, very difficult artists for many people because they might exhibit the small strip of metal fine pieces of metal across a very large white wall and that's all there is.

JLK That's true about a lot of the minimal artists. (I was thinking about something I saw recently by Donald Judd) where I guess that kind of rule bound work would apply, if they think they have rules.

So you think that it is fair enough assumption, that all artists would have some kind of rules that you could select, it you had a big enough body of work?

JLK Sure.

RAK I think best evidence of art is, when you look at an extraordinarily protean artist, like Picasso. And if you are fortunate to see a major retrospective of the work as we did some years ago in France, you see that from the time when he was a little boy until he was an old man, changing media, changing styles, creating whole new movements, some of the same things ran through all his work.

Of course capturing that same thing is the challenge of writing formal rules for an artist's language.

JLK And its very noticeable in Miro, and Matisse also. I just gave a series of talks on Miro recently and I used his early work to show that, as a young man, he was ready to do the kind of organic abstraction that he ended up doing as an old man. The kinds of forms that he used in his mature work and the choices he made were very similar to his youthful work when he was twenty years old or so. He was producing self portraits, totally figurative and yet filled with abstract shapes that we are generating on the Macintosh right now.

SC Have you seen the Bruce Goff exhibit at the Octagon Museum in Washington, DC?

RAK No.

SC I want to get down there [to see the exhibit], because of the rules he used in his designs. Most people would look at his work and not really see any relationship between any of his work, because it's so way out, if you are familiar at all with his architecture. In a class with Lionel [March] about nine years ago, I actually did a spatial analysis and discovered some very simple, very clear rules about the way he organised the topology of his floor plans and the geometry he used. Very simple, very clear, but most people would not see any

connection whatever between the houses.

RAK Does he do it out of habit, or out of expressed intention?

SC Well, that I don't know. It must be expressed intention. I mean, I looked at his houses, I looked at the corpus of work. Well, with topology he's used radial, concentric and linear [circulation] layouts and that's basically it. Plus two or three very clear geometries and he mixes and matches them. Most people wouldn't even pick up on this because they're just so overwhelmed by the bizarreness of his designs. The orange carpet on the roof. They can't get past that.

RAK Yeah, well that's why I guess, looking at a whole lot of work and being sensitive to the particular art as an architect, or whatever, you...you are bound to come up I think, with the common denominator a man always seems to follow. It's like a person's handwriting, which doesn't change, even if you want it too. It doesn't change all that much.

RAK We were talking about Harold Cohen. The other day, Joan and I saw just a small sketch consisting of no more than about a half dozen lines. We looked at it and we both immediately had the same reaction: "That's Harold Cohen's line work!" And it wasn't by Harold Cohen, but we both had the same reaction because his program draws similar lines. That led us to think about an issue that I'd never seen discussed , but it sounds like a very simple question: How do you draw a circle?

JLK We asked lots of artists how they drew a circle.

RAK Most give you a silly answer. They say, "I choose a centre and I draw something that is equally distant from the centre."

JLK Do you know how you draw a circle, or what you do?

[DB draws a counterclockwise circle in the air]

RAK Well you see the issue is that there are many different algorithms, all of which will let you draw a circle. One is, you start drawing a line, then you determine how far it is from the centre, then you correct it and so on. Another one is that you start drawing a curve and you keep going on with that curve and see whether it looks like its going to close, then you correct it. And there are many, many different algorithms in between those. Well there's one that Harold Cohen presumably uses in his programs you see, and it produces a particular line quality, which is tentative and halting, but not say the way Paul Klee's line would be tentative and halting. And yet that particular kind of line work you immediate recognise in this very simple little geometric sketch of something we'd seen. We both saw that as Harold Cohen's programming, his AARON program of line work. So even at the level of a single line his style can be recognised and in the case of Harold Cohen, demonstrably proved by that program.

You stopped at colour depiction in Diebenkorn works; and Raymond Lauzzana thought Pollock's work was too difficult to fully represent in rules, — How could you make a grammar that would depict that kind of depth, — because it was too complex?

JLK Its not being complex, the rules are probably pretty simple, its dance. Choose a canvas and dance. No I am joking, but still.

RAK Something you may have forgotten that there's an asymmetry between structure and behaviour. Some very simple structures can create extraordinarily complex behaviour, that's the whole field of chaos for example. Okay. Very simple rules produce things which are unpredictably complex. So when you look at a Pollock painting, you say, "That's complex". What you're saying is that the behaviour of those rules are complex, but whether the rules themselves are complex, is not at all clear. The rules might be simple or complex.

JLK I'd keep it fairly simple. A lot of course depends on accident and whether you choose to keep that accident is a question of taste, you know, whether you think it fits in the picture. This kind of gesture could either produce a wonderful long filmy line or it might create a splash on occasion, which might look very different, but the behaviour might be more or less the same, except for the accidents he painted.

RAK In the computer field we haven't come to grips yet with this, I think very profound, asymmetry, because we hold to the conceit, that because we can build machines, or we can write programs, that therefore we can understand the behaviour of the machine or the programs, but that's not true, we cannot. We cannot understand their behaviour and when you look at some complex phenomenon and you say its complex, therefore the rules must be complex, that simply doesn't follow. The rules might in fact be very simple and so going uphill from the behaviour to the rules—essentially is a difficult task. Fundamentally it,s a very difficult task. Whereas going from simple rules to complex behaviour is, of course, a simple job. That's the reason why you have computer graphics today, because writing programs that will produce complicated behaviour is easy, but starting with something which is complicated behaviour and finding the rules is essentially difficult. So the whole computer field is devoted to doing synthesis, not analysis: synthesis is easy, analysis is hard.

Can you see much future for people who want to use grammatical analysis for art and design education?

RAK The future for it I think is that, there are smart people around and may of them have not had the benefits of the kind of powerful tools that we have for trying out what they know, that is for implementing their ideas in things like grammars. And the task right now,

it is quite an open question, is to supply these smart people with the kind of powerful tools that we have to see whether they can in fact, do better than rhetoric. I think they can, but that remains to be seen.

Grammar for images, actually was first seriously discussed in Australia. It was a conference called "Picture Language Machines". It was based on work that I had done. I was invited to the conference—unfortunately couldn't attend. It was sponsored by the Australian National University and there are several people who have since gone on to become important in Australia in dealing with images. One is John O'Callaghan. He's the head of the digital imaging division of CSIRO and Robin Stanton, who's the head of the Computer Science Department at ANU. Quite a few other people were talking about writing grammars of images of various sorts. Very interesting conference, it was published in a hard back book, whose editor is S. Kaneff. It's the earliest occurrence other than in my original paper, which was 1964, the earliest occurrence of serious discussions of the application of grammars dealing with imagery, not just in the arts, of course. And that was in Australia.

What about Chomsky's work. Do you think that he is right?

No. I think that Chomsky is still wrong.

Is there any part of Chomsky's structuralist work that is useable.

RAK Well of course. Chomsky certainly deserves credit for being the first person to introduce formal models, but unfortunately his formal models were more useful in Computer Science than for natural language. His formal models for natural language were like "the light that never was on land or sea". When Chomsky first published his so called "Three Models" paper, about 1954, I read and was quite fascinated by it,—but I wasn't a linguist. Nevertheless, it was very clear to me when I attended a conference of linguists, that that everybody was denouncing Chomsky's work, which I found so interesting. Everybody was denouncing it but they were denouncing what they didn't understand. They knew there was something wrong there, but they didn't know what it was that was wrong. Then over a period of years Chomsky, who was a fierce advocate, extremely strong arguer and very clever fellow, but wrong, I think, managed to convince the whole linguistics community, that he had deep insights. Every time his insight began to be seen as weak, he was off doing something different. So he was always ahead of the competition.

Thank you.

Terry Knight: Interview by Dean Bruton

Department of Architecture, Center for Advanced Visual Studies; Design and Computation Group in Architecture, Massachusetts Institute of Technology

13 July 1996

Terry Knight is a Professor of Architecture and author of the book *Transformations of Design*]

This interview is really part of a PhD thesis which demands a knowledge and understanding of grammars as a loose analogy, but also thinking of it in terms of formal systems, and your work is relevant because you have been working in the area of art and you're really one of the pioneers of developing grammatical understanding within the practice of art. I am less interested in grammars as a means of representing the designs of artists in the past, but I am more interested in the relation of concept of grammars and the process of making designs as you are, I think, especially Donald Schöns ideas of the reflective practitioner. Have you been using the idea of reflection within the work that you do, in grammars in this institution or at UCLA?

Yes, I have. In the beginning I have to admit there was hardly any reflection in using grammars because most of the work that we did was very experimental and I basically did not know very much about what I was doing or what was going to happen when we used grammars. And that was very delightful in the beginning. I am am talking about five years ago.[1991] We had very small groups of students that I was working with. We basically ran experiments with grammars and we weren't reflecting very much in the sense that we weren't thinking very carefully about what we wanted to happen. More and more though, as grammars began to be used in the studio, we are reflecting more on what we are doing, when we are doing it, and how we can modify grammars, add rules take out rules, to achieve some final goal. Even with that final goal,—we also modify it, and what sorts of rules are dropped out. I think that will be a very interesting project.

Would you say that it works across the board for artists, architects and designers?

Yes, because even though in architecture the goals are more explicit in working towards a more particular end, but even in art, but in the end, you do also have certain goals in mind. You are not creating thoroughly whimsical pieces most of the time. You set certain constraints for yourself on what you want your final thing to be like in terms of form or expression.

How do you see the place of grammars in making new designs—as loose analogy and, as formal system?

As a loose analogy I think grammars have always been used in making new designs. I think that designers , artists or architects do use rules, but again, rules as a loose analogy. They do use rules when they are making their designs. They just don't write them down and they may not be very conscious of what they are at the time.

In a more strict sense I am trying to use actual formal grammars exclusively, in coming up with designs. Historically, grammars have been used as a loose analogy and now they are being used in a more formal, explicit, and conscious way.

When would it be useful for an artist to use a formal grammar?

That is an interesting question because most of my experience has been with architects. I would say for architects that I can't think of any occasion when it might not be useful unless you don't have the experience with grammars or the time to sit down and work out some formal grammars.

In art I am not sure what my answer would be. A lot of it I think has to do with how facile one is with formal grammars and at the beginning noone has any facility with formal grammars. They are totally foreign things for most people so it takes a while to learn how to use them. Then, of course, once you know how to use formal grammars, it becomes easier to manipulate them, and use them effectively in a reasonable amount of time. So a lot of it has to do with training. People must be given sufficient background in grammars before they use them.

What would be the advantages for artists to use grammars in their work?

Because it enables you to explore all kinds of new ideas. If you have an idea, you can look at the idea and ask, " what rules am I using now?". And you can make formal grammars in terms of those rules and basically explore some compositional ideas that you might have through grammars. You can get a multiplicity of ideas from maybe one initial one by applying the rules.

It also allows you to become more conscious of what you are doing. It gives you better control over what you are doing and possibly better results in the end. It is a way of very carefully thinking about what you are doing, and forcing you to think about what you are doing.

Do you ever use computers as a medium for graphics/design etc and if so what is, or was the experience involving derivation and rules?

I have never used computers to do grammars. In the beginning classes that I teach I tell my students not to use computers because they

often spend a lot of time in the programming aspect, just getting the computers to work rather than learning about grammars. All the work they do initially is hands on. All the work I do is on paper and with models. I have a kind of personal dislike for computers. I would rather not be dependent on machines. So I do everything myself. But I have had students who have developed grammars using computers and they do good work.

When I proposed teaching undergraduate classes at MIT this year I was told that I could not disallow the use of computers because there are so many undergraduates who are so adept at using computers that they should be allowed to do it. I am going to have to change my ways.

Are there artists/designers/architects whose work you regard as particularly grammatical?

That is a very loaded question. An artist's or designer's work becomes particularly grammatical only when a grammar has been written for her or him. The moment a grammar is done, the designer is seen as grammatical, and before that they may not have been seen as grammatical. Frank Lloyd Wright is a good example of that. Before that grammar, the Frank Lloyd Wright grammar for Prairie houses, many people pointed to him as an example of an architect for whom a grammar could not be written because his architecture was very organic etc. Then a grammar was written and he became particularly grammatical. A lot of people will point to very simple geometric designs like quilt designs and say , well here is something that is obviously grammatical. It is true that many of those can be characterised in terms of grammars, but on the other hand there are many "ungrammatical" types of things that can become grammatical.

Would you name some artist examples?

Paul Klee. He is another example of someone who you might not think of as being grammatical but, a grammar has been written for Paul Klee. Richard Diebenkorn is another example. Fritz Glarner, Vantongerloo.

What distinguishes art from design?

I don't think there are really any significant differences between art, architecture and design. But people think that architecture is different from art because in architecture you have certain demands, you have a client, and there may be more explicit goals. But even when you have very specific goals there are so many different forms that could satisfy those goals. The goals don't really play very much more of a role when you are making a building than when you are an artist and you don't have such explicit goals.

So I don't really see that much difference. I think in terms of constraints, that comes up all the time when grammars are used, but

there are constraints whether you are an artist or industrial designer, graphic designer, architect . It is the nature of the constraints that are somewhat different. In all those cases there are always a multiplicity of different compositions or forms, whatever, that would satisfy those constraints and that is the important thing to realise.

In architecture people often do not realise this. They think, well you have got these constraints and you have got one or at most two different forms that are going to best satisfy the constraints and that is really not the case. That is why grammars are useful because they can give you a whole multiplicity of solutions to the same set of constraints.

Is design computation?

It depends on how you define computation. You can define computation in different ways. If you think of computation as a series of steps, ie, you do one thing first and you follow it with something else, and so on, then obviously, any design process is computational because it is a sequence of events,—It is a computation. So yes, in that sense I would say that design, art and architecture is computation. It can be looked at as a derivation.

Would you comment on the analogy between natural language grammars, Noam Chomsky's work, and visual language grammars?

There are obviously a lot of analogies between natural , or spoken language grammars and visual grammars, because they both use sets of rules. So formally they might look the same but the intentions of the two kinds of grammars are very different. First of all Chomsky was looking for a universal grammar, for things or rules that were, or are common, amongst different languages. He was looking for universal, fixed things, fixed rules across different languages. I don't think that that is the goal for any visual grammars,—although it might be for some people. I personally have not looked for universals in visual languages or grammars. I don't know that it is that interesting, very useful, or fruitful—but that is another story.

The other significant difference between visual language and spoken language is that spoken language and grammars for them are learned unconsciously. You grow up learning a particular language and you don't give much thought to it. Whereas visual languages are ones that you are conscious of and ones that you invent. People do not go around inventing their own spoken languages. The goals as we go along, if that's permissible. So yes, the process of designing with grammars is very much like the process of design in general in that a lot of reflection happens along the way. We think about what we are doing and how we can change it.

"Derivation sequence according to rules is known as a grammar." — Is that an accurate definition?

No, maybe we could rephrase it. The grammar itself you can think of as just the rule, and then, defining the rules creates the derivation. is the rules. The derivation is the result of applying the rules. So it is just a matter of terminology.

Can you name some artists who appear to work with fairly strict rules?

Well, the artists that I looked at for my PhD dissertation: Vantongerloo and Fritz Glarner. I was able to write grammars for them. [laughs] Yes, they did use strict rules. There is also a grammar that was written for Diebenkorn paintings.

I am interested in a contingent sense of grammar, that is when rules appear to be used, when they change, when there seems to be a sudden change in a derivation, and how much rules appear to carry over from one work to another. —Do you think that it is a sensible area of investigation, is it appropriate and, does it add something to the body of knowledge about grammars?

Yes, definitely, in fact it bears a lot on the kind of work I am doing. Since more and more I am interested in what is happening when people use rules: How they go about formulating rules and how do they change them? What kinds of rules they are, is something that is learned unconsciously and is shared by large groups of people. We don't go around consciously trying to change our language. That happens over long periods of time and mostly unconsciously. Whereas designers are more concerned with making grammars in an informal sort of way, possibly in a formal sort of way.

Can you describe the process you might use to find a grammar for an artist's work?

I don't think that anybody has written a grammar for an entire body of an artist's work. One of the first things you have to do when you are trying to write a grammar, is to decide what the corpus of the grammar is going to be, ie, select the works that you are going to write the grammar for, because there are always works that are, or seems to be inconsistent.

You need to look at as many works as you can get your hands on and then narrow down that group of works to a body of works that have certain consistencies, formal consistencies, spatial consistencies, obvious regularities. And that might mean even getting even rid of some works that seem emblematic of that person's career. You might narrow it down to a series of works to a specific time period. So that is really the first step in deriving a set of rules.

Once you have got a corpus narrowed down then really it is a diffi-

cult and sometimes painful process of trying to extract shapes or forms that are common to the works; relationships between forms that are common to the different works, and then express the relationships and vocabulary in terms of rules.

It is often very frustrating because you might come up with a set of rules that seems to work for almost all of the different pieces but not one that you really want to include, so you either have to change you rules or get rid of one piece. So it is a long process of discovery, essentially.

There are many different approaches, some people prefer to just look at the works themselves and not be influenced by what other people have written. Other people prefer to immediately go to secondary sources about the artists and find out what other people think about the works and try to work from these ideas but that may lead you nowhere too.

What I have done in my own work is to look at as many things as possible. First I look at the works in an as unbiased way as possible so that I can formulate my own visual opinion of what is going on. I might go to secondary sources to see if that either contradicts what I have done or confirms it or leads me in a different direction. Most of the grammars that have been written for artists or architects are pretty much original in the sense that they don't come from someone else's ideas about what was happening. At a certain potion they kind of go off in their own direction, the grammar becomes the grammar writer's own theory of what is going on.

Have grammars resulted in particular insight or deeper understanding ?

I am not an artist and I have not used grammars to come up with my own art work so I can't address that question honestly, or with any authority. From what I have seen, I don't know of any artists that have used grammars formally.

Many continue to keep things at the informal level and want it to be that way. There are people like Peter Eisenmann, who use terms right and left like "grammars" and "syntax" "fractals" and "self similarity". He uses the words but that is not what he is doing. He just uses those words as a way to describe what he is doing and a way to promote himself too.

Thankyou.

John Lansdown / Gregory Moore: Interview by Dean Bruton

Middlesex University, Cat Hill Campus

27 July 1996

Emeritus Professor of Computer Aided Art and Design at Middlesex University and Gregory Moore is a Lecturer in Architecture at the Cat Hill Campus, Middlesex University. Lansdown wrote the book, *Computers in Art, Design and Animation* (1989).

Could you explain your reservations about grammars?

JL Yes, human beings are good at certain things and they are not good at others. Two of the things they are not good at is working entirely randomly and working entirely to rule.

It seems to me that, at least some of us should be looking at rule based art and design where we follow exactly the rules. Computers are very good at following rules and very good at generating random output. It is these two areas that I think we should be using the computers to exploit. Whenever we have seen examples of rule based work in the past, like for example Schoenberg's 12 tone system, we have found when the output did not suit the feelings that they had about the music then they changed the rules. This seems to me a poor way of going about things and if we are going to look at rule based art, music or dance then we should fully exploit the rules: devise rules and accept what output comes from them without any intermediate aesthetic judgment.

Can you explain what you understand as a rule and a grammar?

JL My recent work suggests there are only two forms of grammar that are likely to have creative potential. The first of these are recursive grammars. Natural language is recursive. It works with recursive grammar. This allows us with a fairly limited set of grammatical rules to generate an infinity of sentences. The other form are called array grammars. These are quite different. Whereas recursive grammars are essentially hierarchical and top down, with array grammars such as cellular automata what happens at a particular point is only dependent on what happens around it.

Could you say there are two approaches to grammar one might take as an artist?

JL Most artists produce conventionally a sort of dialogue between the artist and the medium which he or she is using. There are others ways of producing art, for example, entirely randomly or according to some preset rules. Strangely enough people are not very good at doing things entirely randomly or doing things entirely to rule but computers are good at these two things. So in a sense, where design-

ers and artists can do well is in this middle ground between an entirely rule based approach and an entirely random approach.

I have pursued over the years the ideas of entirely rule based art mainly through my work on computer generated choreography and entirely random work. Random output is difficult to understand and we have known this for a long time in for example, music. In the early days of using generative techniques in music for example, it's known that in medieval times composers used to bend bits of wire and throw them on the floor and the resulting shapes were then used to delineate the sort of melodies, the line of the melody to be played. We also know about dice music which was an attempt to use random notes in musical composition. But it's only comparatively recently that we have been able to devise rules to make art works. My old studies suggest that there are just two forms of rule based working that have creative potential. One of these are recursive rules, the rules of a natural language grammar are for example recursive and these allow us to make an infinity of statements from a comparatively small number of rules. So that is one form of rule based work, recursive rules which are hierarchical and essentially top down.

Another form of grammar which has creative potential is an array grammar where what happens to elements in the array depends not on some overall hierarchical set of ideas but simply what happens in the rest of the array immediately surrounding the particular element.

Now when we look at the sort of Stiny based shape grammars they don't seem to me to fall into either of those categories, either hierarchical, recursive grammars or array grammars, they seem to me to be simply a collection of rules, more or less related to one another, but not related in some recursive and hierarchical way. Hence I don't think that shape grammars, the Stiny-type of shape grammars, are an admirable idea as they are, because they have the creative potential to make art works that we can respond to in a similar way to the way we respond to conventional art works.

One of the things George Stiny said was that there was a continuum, that a loose analogy of grammars eventually develops into a formalist system. So would you see that as a fair thing to say, that perhaps the recursive would end up the logical end of a continuum for someone who had started with shape grammars.

JL Well it won't automatically do that, you have to set up the grammar in order to be recursive, so I am not clear what he means. I don't think there is a continuum in that sense but for example, recursive grammars in the form that I suggested are very different from array grammars and these are not on the same continuum. So these are distinct and separate things, so I am not clear if I've understood what he means. But I'd go along with that.

I am interested in a contingent sense of grammar when rules appear to be used, when they change, when there seems to be a sudden change in a derivation, how much rules appear to carry over from one work to another.

JL So what you are looking for are rules to explain a work than rather rules to generate the work. I've done very little on that so I can't say anything about that.

It does seem to me that you could, with any work at all, devise a set of rules which in retrospect would generate it that seems to me to follow, and essentially this is what the shape grammar technique does, it takes a of body, it examines it and tries to derive rules and now of course, Stiny and others are not suggesting that these are the actual rules used to generate it but they are rules used to explain it. Because as I said earlier, it seems to me that that just produces a set of unrelated non-hierarchical, non-recursive rules.

How do you see the place of grammars in making new designs?

JL I see them as a useful approach. As I say in all my work on computer choreography has been based on a generative approach. I take the view that once the rules have been devised in this hierarchical and recursive fashion the output is largely irrelevant. It is the rules that are the art work.

So you don't see much place for the loose analogy of grammars within the practice of art or art education?

JL As an explanatory medium, yes. But not as a generative medium.

So when is it useful to use formal grammars?

JL Well, if you wish to devise artworks which are based on formal grammars.

If you use the loose analogy of the grammatical metaphor, there are rules, say themes, transformations, derivations that an artist uses, it is a very loose kind of thing.

JL Yes that is just a bundle of techniques though isn't it which people use to assist them to do conventionally creative activities. So people should use whatever techniques are valuable to them to help them create in a formal way but this is very different from the idea of using grammars in order to generate a work.

Do you ever use computers as a medium for graphics, (which obviously you do), what was your experience as a medium involving derivation and rules?

JL I am not sure I understand.

You've mentioned the choreography and so on, did the computers assist the derivations within your choreographic work

JL There are certain things that you wouldn't think of doing if you didn't have computers. Imagine the following array grammar, that

you divide a canvas into an array of tiny squares and you give each square an address, which you give an address in an horizontal direction and an address in a vertical direction and for each square you divide the horizontal address by the vertical address. Then you look at the third decimal place of the resulting dividend and then you put a colour from zero to nine in, according to what that third decimal place is. Now as a rule based piece of art, you and I have no idea what the outcome of this will be, it is entirely deterministic. But in addition we wouldn't have thought of doing that if we didn't have a computer to help us do it The rule set which is just this one rule, a simple array grammar, derives entirely from having a computer because no-one would dream of thinking of making an artwork conventionally that way, you would have to have a computer to do it.

Are there other artists/designers/architects whose particular work you regard as particularly grammatical?

JL No, I don't know of any who use an entirely generative grammatical approach. There are lots of people who use collections of what they would call rules, but these are just pegs on which to hang conventional grid activities. In music, of course particularly in electronic and computer music, there are many artists and composers who use generative techniques. But the creative potential they have given is not carried over into graphics, painting or any of the other areas and I don't know of anyone for example who uses generative techniques other than me to create dance.

Do you think that there could be a visual language equivalent to say, a Beethoven symphony?

JL I've not thought about it. What would be the value of that, every medium has its own particular Zeitgeist and obviously it would be useful to explore whether a rule set which was useful in one medium —how it might be useful in another medium but in general you tend to devise different rules to suit different mediums.

What the question is getting at is the semiotic content of artworks, people talk about spirit, soul, otherness, the expressive quality all sorts of adjectives are used to describe to say what a Rembrandt portrait might give off that is beyond the formal qualities.

JL Yes, clearly and in some artworks we respond to it because we have shared experiences with the artwork particularly if it is a figurative work. We can identify with it because we know what it means but where does the emotion, where does the spirit exist except in the output, it's only in that and the emotion exists in the viewer rather than in the works. It is the way in which we respond to the work rather than anything in the work itself, other than this concept of shared experience. So if we look at an abstract work, what it triggers in us is within us and not in the work itself.

So is it conceivable that if you can find a rule-based grammar for a Jackson Pollock or a Rembrandt or a Rothko, painters that people believe have something more to offer than just pigment that grammar if it could be conceived and developed would automatically give off that otherness that people talk about?

JL Well, I assume so because the otherness is only in the output, it is only in the work, that is the only contact we have with the work, so I assume that would be the case. Though I would essentially be against any working towards that, other than some intellectual task. It does seem to me that we should be using rules based approaches to generate works that might not have been made by people, people can who do their own art are very good at it and we can respond to it. We should use rule based techniques to generate artworks that people wouldn't be able to do themselves.

Would you agree with the statement that design is computation?

JL Well, I am not sure I understand it.

Computation could be interpreted as sequence, one thing follows another. It could be interpreted that design is also a sequence of things that might follow one another.

JL In that sense, the answer would have been yes, but it doesn't seem a very meaningful or useful metaphor.

Can you distinguish design from art in some way and can grammars help with that task?

JL Usually design is meant to refer to things which as it were meet some needs. Often when we speak here to the students at the beginning of their courses and we ask them to, the Masters courses that is, whether they considered themselves to be artists or designers, they won't make such a distinction, so I really have nothing to say about it.

[pause for airplane noise]

I am sort of ambivalent because whenever I discussed it with students they've always floored me by making, whatever distinction you try and draw you run into difficulties. The one that I did suggest was that we normally speak of designs as trying to meet some needs. It seems to me there are some distinctions that you can make.

But then art can satisfy needs as well.

JL This is the argument that they all use. The difference is the need, from a design point of view is an expressed need by someone in which you intend to meet in art.

[Gregory Moore (*GM*) joins in]

GM and, also you can measure whether you have met it. Not necessarily with a tape measure, but measure in a rational way, in art you

can't do that and most contemporary artists would resist the idea that you could actually measure the performance of their work. I think that is the key difference between art and design and I've yet to find anybody to break that argument up, simply because artists refuse to submit themselves to that kind of assessment.

JL But many designers do too.

GM It depends also on who you consider designers, and I tend to think of people like architects and product designers when I make those kind of distinctions. Other people call themselves designers, take someone like a fashion designer, they would also like an artist refuse to accept some kind of performance standard and therefore I would question because that is my definition of design whether they are really designers or crafts people.

JL Yes If you put that to Jacky Gilligan who is Head of Fashion Design here, she would not agree,— because of assessment based on performance in business.

GM I suspect a lot of people in business would take exception to that as well. If you are someone like Sachs and you intend to go to Paris and buy some number of gowns from some of the major designers and had to make money out of it, then there must at least be some kind of economic performance but again that is not how people, particularly students, and I think also post-graduate students like to look at the world, maybe that is a measure of attitude within the academic performance.

One of the things that has come out in this discussion with Raymond Lauzzana for example, was that he felt that all things were able to be interpreted as grammars, he could see, given enough time, the world could be computed.

JL That is semiotic view, if everything is a sign then nothing is a sign and if everything is a grammar then there is no grammar.

GM Like music and jazz.

JL You have to say, a grammar must mean something special which is distinguishing it from a set of related rules for instance. What they are wanting to mean by grammar is that you could devise a set of unrelated rules. But to believe that, that you could define anything in those terms. That is not the same as saying it is a grammar which would be some sort of structure, and in my view, recursively structured arrangement.

I have suggested, which is something that I have been working on for some time, that there are only two forms of grammar which can be used beyond explaining some particular point and that is a recursive grammar like a language grammar, and an array grammar where what happens depends on position. I can't see any other form of grammar that has any scope for development. All the rest are sets

of unrelated rules.

GM I think the classic one is the Prairie House grammar which is not a recursive grammar and you can generate Prairie House like designs but it lacks some kind of richness or depth because it is not recursive.

JL It is a recursional grammar, as I have said, that allows us to develop an infinity of sentences from a comparatively small set of rules.

GM And also to develop a rich set, because one could devise grammars for mathematical expressions which generated a rather thin set of mathematical expressions, They may be grammatically correct but have no particular value leading up to nothing. Yes, it is the value of the grammar and again I am beginning to suggest that you have to have the performance standards and an arbitrary, "I like this", is not good enough for a designer, however it good it might be for an artist and I am not going to say whether it is or it isn't good for an artist. I am not an artist and I have no pretensions to be, nor am I an art critic, but for a designer you have to be able to say is this value, does it have worth, does it have value? I think it is the same thing if you are designing a grammar, you have to say what is the value of this grammar? If it actually has no value then as a designer I would say the grammar needs further work on it.

JL I think this is the problem with the shape grammar approach it is a collection of arbitrary rules chained together and that is not what happens with language. Words are not chained together.

GM I think another thing about grammars is that the only grammars that I have come across until the early 90s, I have to say I haven't actually studied them in depth, dealt only with spatial positioning and usually architectural and mostly,

JL and usually 2 dimensional ...

GM and most of them were architectural and they had reduced an architectural problem which was an immensely rich and complex problem down to a 2 dimensional arrangement of spaces.

JL which is a very thin vision.

But the argument is that it was only the starting point.

JL What more do they want? George has been at it now for quarter of a century or more. By now it should have got somewhere. Now some people like Gerhard Schmitt has tried it in two and three dimensional ways but really it was a great idea which wasn't developed.

GM It's because it was unable to break out of just a spatial arrangement, just take a very simple problem, you want to be incorporating your grammar: Daylighting, there is nobody who has taken that on. Now if they say they are getting to that then we will have to sit back

and wait but what I expect them to say is, "We are not addressing that." If they are "Not addressing that" and this is a crucial problem in architecture and design, what is the value, I come back to the worth of the exercise.

There are a lot of other things going on in computer design that do have value. So with natural language you have context which allows you to bring things into language that are not explicitly there in a grammar. The grammars that are being proposed for design seem to lack context, context free grammars are great in computing.

JL Yes, and a lot has been done in this area.

One of the things that George Stiny said was that he was having trouble with the people at MIT who have this Newtonian view of what computing was all about.

JL That is a strange thing for George to say because I would have thought that when you speak to Richard Coyne, that he would regard Stiny as an arch exponent of the Newtonian view of the world or at least the Cartesian view. Again, it is probable, almost always in discussions on art and things like that, we talk as though we were all using the words to mean the same thing and I am not sure we are. It is very hard to understand sometimes and people sometimes hang labels on things like Newtonian on this case as a term of abuse presumably.

GM It is a very peculiar thing to accuse computer people of.

JL I don't know what George Stiny means.

GM It is a bit like the American use of the word "liberal" isn't it.

I think Stiny was describing an approach that he thought the "other side of the camp" used that ended up at a "dead-end", with "the" products. He saw grammars as having the ability to grow because you build with an extended set of rules.

JL All he believes is that what you do is accrete rules, that's what he believes in is building, and that is not to me the way in which grammar works in natural language.

Maybe you could say something about the overlap between the natural language and visual language grammatical idea. Can you map that natural language approach on to the visual language?

JL Only at the level of recursiveness it seems to me, that you define things in terms of themselves in order to ever to be able to explain the richness that otherwise you have to have.

One of things Krishnamurti, when he came to the Adelaide University expounded on was Chomsky and how Chomsky started it all, how we eventually took the natural language idea of grammars and imposed it on architecture and visual lan-

guage.

JL He was wrong, he didn't.

So lets clear that once and for all shall we. Could you explain to me how ideas about the grammar of natural language has attempted to be mapped on to visual language.

Natural grammars are recursive, in general the shape grammar approach has not aimed at recursiveness. It is aimed at accreting, gathering together lots of specific rules to deal with certain things. Hence you have to have a different grammar for Palladio, or Frank LLoyd Wright or whatever. We have not properly attempted to bring recursiveness into the shape grammar approach. Until we do I don't think it will have the creative potential or even the explanatory potential that its champions would make us believe it should have.

Will that happen, is it possible?

JL Yes, it is probable and possible, but when I don't know.

What are the hindrances, why hasn't it happened?

JL I think there has been too much simplification, too much belief that you can explain a corpus of work with minimal rules. Most of the architectural rules for example are two dimensional and of course architecture isn't two dimensional. So there has been too much simplification. The problem is perhaps too hard to be tackled in the way that people have gone about it. The way I approach things from a point of view of recursive grammars in choreography is that I have not attempted to explain or duplicate human actions. I think if the shape grammars approach is still trying to generate rules that architecture is incapable of or just wouldn't think of doing then there are other things more worthwhile to do.

Greg Moore, could you explain your involvement with grammars and give me some idea of what you think about natural language and visual language?

GM I am senior lecturer in computer design in the School of Art and Architectural design here. I am more of a observer of the shape grammar work, my computing design tends to be more numerically based.

The relationship between the shape grammars as its been developed in computing and architectural design and the natural grammars is in part as John said, a lack of recursion. I think like most research, we get out of it what we seek out of it, and I just make the assumption that shape grammars don't rate compact recursive grammars as being particularly important and that is why, one very strong reason why we don't have them. The use of recursion in the natural language grammars is obvious and allows us to develop complex, as opposed to one dimensional sentences, and as John said if we had recursive shape grammars we might develop richer sentences in

those shape grammars. It has to be said, and it hasn't yet been said that in suggesting that we need recursive grammars and it is not to suggest that there is a grammar that would solve the problems. There are many natural languages and each of them has their own grammars. The most striking differences between the grammars seems to be where the object develops and the subject of a sentence occurs. In English, you go subject, verb, object; in German they go subject, object, verb and in Polish they go object, verb subject. All those are workable languages that have produced great works of literature, so there is not just one ideal grammar.

Secondly if you look at Irish, Irish like English was originally explained with a Latin grammar, which actually was a very difficult grammar to come to terms to with and in the mid century, this century, the Russians proposed an alternate grammar for Irish Gaelic. That proved to be an enormous simplification and made learning Irish Gaelic much easier. So there could actually be more than one grammar to describe a language. Many people might view the 17the and 18the century tend to explain English in terms of Latin grammar a mistake but we all learnt English, so I guess it sort of works, I don't know about Welsh.

I think that we can learn from those things about natural language, but as I was saying before when we speak we don't speak just strictly according to that Latin grammar that has been imposed on English. How we put sentences together is enriched by using context and how we understand the meaning of sentences is enriched by using context and one of the problems is that the shape grammars have come out of the formal grammar movement and are largely context free. I don't think design can be done with context free grammars, I think they require context dependent grammars. So I think that is something again that we can learn from natural language.

Having said that, natural language, or the language is essentially one dimensional and certainly architectural design is not.

Can you see artists and art education involving shape grammars or grammars in the future in any work?

JL I think with more use in computing it is inevitable but I have to say there is very little interest with the art students here in doing any rule based work. It is very rare to find anyone who is interested, now this may be because of the foundation level on which most of the students would have come. The idea of art as self expression is very strong and rule based work is almost the antithesis of self expression. So it may happen, but I think it will only come about when people the distinction, when you see the distinction between in computing for instance, ie as Herbert Brün once said about computer music "It is one thing to have an idea of a sound and to devise an algorithm to realise that sound, it is another thing to devise an algorithm and found out what sort of sound it makes and until artists

and art students can make that distinction between using algorithms to realise some idea they have and devising algorithms to see what they can do, we won't have a great movement towards rule based work."

Devising the sound of an algorithms seems to me like trying to found the sound of one hand clapping.

JL I gave you an example earlier on of an array grammar approach where the fact that you have a computer to help you do things makes you think of quite new rules of making art works. The real problem and it is early days yet of the use of computers in art, most of the work that people will use computers in art is to use the computer to help them deal with things that they would otherwise do in a more difficult way or worse way if they didn't have a computer. But what they really do is look at the use of a computer to produce entirely new approaches to art.

Greg have you used grammars or rule based approaches to developing new innovative designs in your work here?

No.

Are you thinking of doing it?

GM Yes, we are proposing to introduce teaching generative computing generative methods into the proposed undergraduate architecture program and since I haven't started I can't tell you what the experience about it is, but it will be much wider than just grammars. There are pre-grammar generative method techniques that one might look at and there are also other generative methods like genetic algorithms and so on which don't rely on grammars which we would also want to explore. I think that there may be the potential for grammars in certain aspects of design particularly in the context of highly constrained design work and here I am not thinking about space planning but for example jointing materials, provided you can devise context dependent grammars so the joint not only depends on the shape but obviously on the materials, eg, how you detail a window and sill depends on its context. So I think there is potential in that context. I am sceptical of there being potential in using formal grammars for things like planning in general and form giving in general. I think they are too superficial for that.

What about analysing the history of design for example?

Architectural students and architectural historians at time have long talked about the grammar of a building but they use that expression in the same way that they talk about geometry for instance as soon as you talk to them about geometry they back away because they don't really mean geometry, they just mean shape. So when they are

talking about the grammar of a building they tend not to mean grammar in the formal sense but just a very informal sense, like the grammar of Greek columns for example. So in a formal sense, the value in using shape grammars,—today I would have to say that I am sceptical of that, if you can show me work that has been done and its value in it, that's not how people think about, the people who teach the stuff, how they think about it. They don't think it can be useful.

Can we learn anything from musical grammar?

GM When people talk about art or formal grammars it surprises me that they ignore music. We have lived with a compact formal grammar since the 16the century.

JL Anders used a generative techniques, the other thing of course is that it is abstract, so there no-one has any problems at all about accepting that the emotion is only in the output, but somehow for painting, they think it is the artists emotion that somehow gets transferred. We have no method of knowing what the emotion was when the artist made the work.

One of things that has come out regularly in the conversations is that the visual language has not the articulation that the musical language has developed Music has names for all of the various details which doesn't seem to be the case in visual arts.

I think if you look at something like architecture, I find music as closer to art and architecture than say painting and in architecture we do have the measure of much. We have names for most things, we have a sense of dimension and we use a lot of the same vocabulary which is I suppose common to all aesthetics but it is important to us in the way that it might not be important to painters to know about scale, proportion, colour, texture, balance, contrast, rhythm and so on. There is an enormous overlap in the language of music and the language of architecture, now even if we just move to product design, that is not the case. Even though I think of all the other design disciplines, I think product design is closest to architecture design, but you don't have the same closeness in using a common language with music in product design.

JL It is interesting, that most of the, only apart from the fact that much of design theory is architectural, virtually all of the applications of shape grammars have been in architecture.

Thankyou.

Raymond Lauzzana: Interview by Dean Bruton

Penrose Press, San Francisco

2 July 1996

Raymond Lauzzana, editor of the journal, *Languages of Design*

Would you describe your contribution to art?

Well, it runs along these lines. The way to understand it is to think about the nature of a computer graphics display. People generally know that the screen is made out of pixels and every pixel on that screen is represented by a number or three numbers but you can concatenate the three numbers together off one number. There are so many combinations of colours that could be in each pixel and as a result it's a finite quantity of possibilities of every pixel in the image. If you look at the entire picture as one big number, that number is something in the neighbourhood of 2 to the 2 to the 2 to the 2 about 10 or 15 times—so something in the neighbourhood of 2 to the 64,000.

That is the number of possible pictures that could be displayed on a video screen. The number of pictures that can be displayed on a video screen to some degree correspondents to the number of pictures that you could see yourself and the only difference is resolution. You might be able to see them in greater detail but you won't get any different pictures. All the pictures you could possible see are in this set of pictures of 2 to the 64,000. So that number of pictures is all the pictures that there are.

Now, when I say all the pictures that there are than includes everything from the man's space flight to Alfa Centauri and the building of the pyramids and the birth of dinosaurs it's everything—it's all possible pictures. There can be no pictures outside this set. It includes Kandinsky, it includes Caravaggio, Delacroix, everybody. That's all there is. The fact that there is a finite number of them maybe doesn't stop you from making pictures but it certainly shows that any picture that you make belongs to this set. So this is the complete set of possible pictures.

One of the things that you need to know about this complete set of pictures if we showed them in sequence and displayed them real time at one frame per sixty seconds, it would take the history of the universe for us to see all the pictures. That's a very interesting result. That means that we are sort of at the end of history and we are about to repeat. We are going to see some pictures that have been here before, in other words some time way in the long past what happens now happened before. That's a very, very, strange result.

But the real result that I hope to see is that artists decision making is

not a question of creating something original because they can't make anything original. You can't make anything outside this finite set of pictures. Your real act is one of choice, choosing which pictures to show. Frank Stella and Richard Diebenkorn. The example of Diebenkorn is with Russel Kirsch. Russel Kirsch and his wife, Joan actually collaborated to do a grammar on Richard Diebenkorn. Then they took that grammar and showed it to Richard Diebenkorn and the results showed what the language was. Diebenkorn's comments were "these are some pieces that I didn't do but I remember planning to do these and then never finished them". Okay,—and that is cool!

I was wondering how he responded.

Yes, it was great. He had a very positive response. You see he sort of thinks of the grammar as a sketch medium.

Frank Stella: one of my students worked on a grammar for Stella's "Rainbow Series" the ones that were sort of Arabic. It's actually hidden in those arabesques, as something very beautiful and very elegant. There is Arabic script in there. So Alan wrote a grammar for it discovered all these relationships. He took it to Stella who was impressed beyond belief. Stella actually then had Allen work for him for about three or four months developing a language which he then used in his later work.

[break for coffee]

What is your view of design theory and design process?

Yes, when you say design theory I immediately think of design process because I think I have thought more about that aspect of design theory than anything else. What I bring it back to is Plato and Socrates and analysis-synthesis as one of them big original design processes. No matter where you begin in that cycle you start with analysis as the issue. You must synthesise something and then re-analyse. So you have got this fundamental cycle which goes back a hundred years or so that has been part of the Western perspective on thinking and is central to the design process.

In addition they came up with the dramatic structure, ... who did what Plato and Socratics in a way depending on what you want to think about that but the dramatic structure, the beginning the middle and the end, the way of resolving the conflict.

There is another take on the design process. The thing that is interesting about that which is very Western is that it does have an end. In other words a beginning a middle and an end and stories fundamentally have beginners, middles and ends. They don't just keep going on and unlike life and history, stories have beginnings, mid-

dles and ends which gives us a sort of context in which to do things. I see it as a series of bubbles leading to the resolution. You can have five bubbles, ten bubbles I don't care how many, you know it's just a set of bubbles, that you start some place and end somewhere.

Does that involve Bruce Archer's kind of core methodology that set models up as a mechanical kind of design process?

It seems to be a very popular kind of perspective that's commonly taught in architectural schools and most design school have some kind of bubble theory with a beginning, a middle, and an end. A model. Very few of them use the analysis/synthesis model the circular model. In other words they see design as something leading to a conclusion like a story. They don't see it as a continuing, unending, perpetual situation.

I would argue they should to be real about it when you got to that last bubble you went back to the beginning. No matter how many bubbles you had. And I will tell you because they don't see it that way, they miss something that is extremely important and in your previous discussion, you brought it up by the way. It was there underlying it.

There are two bubbles that aren't on there because they see it as terminal. If you saw it as cyclic you would at least put one more bubble but because I have thought about it a little bit more, I have put two bubbles in it. I would say the number of bubbles that you put in just has to do with the amount of analysis you have done in passing the problem. You can have three, a beginning, a middle and an end and back to Plato. And whatever you want to call these beginnings, middles and ends you can have whatever you want to call them. Certainly the middle is always going to be this big conflict. And the end in that story is going to be the resolution. But the two missing bubbles are critical analysis problem identification.

Very rarely are Architectural students asked to go off and find a problem. They are usually handed a problem to solve as opposed to saying the world is full of stuff that needs to be done go find one. Now that's a more real approach to architecture. And successful architects know about those other two problems, bubbles. They know how to define problems, they know how to develop those problems as problems not as solutions to the problems but as problems and find money to finance the solution to those problems. Those are things that are not discussed in design school. Nor is criticism. To look around the world with a critical eye and say that sucks that needs work. That's part of architecture, that's to look at it after it's been done in the built environment.

Its developing a critical eye.

Yes, the critical eye —so that's my take on the design process, that it is a circle and one of my favourite quotes is "everything you have

done is a prototype for what you are going to do".

Thankyou.

Lionel March: Interview by Dean Bruton

UCLA and *How House*, Los Angeles

3 July 1996

Lionel March is a Professor of Architecture and Design at the University of California, Los Angeles. As well as pioneering mathematical approaches and shape grammars in art and architecture he has practiced his own art. His recent book on Schindler recognises the utility of grammatical understanding for architects and artists.

In the thesis *A Contingent Sense of Grammar*, I've tried to bring in Husserl, Dilthey and Heiddegger to talk about the depth of conscious understanding ; about how that is possible by applying a grammatical idea to art work, reflecting on that art work, going back, making, reflecting, making, reflecting . The intention was to try and test the idea that you can get to a far deeper understanding, understanding in a sort of phenomenological sense, through grammars. I wondered what you thought about that and whether it has happened for you?

Yes, for what you're doing, it would seem to be much better at my house than it is out here. I have for more than 30 years now, made use of rule systems in art work—things like the grids and all the rest of it that I've used consistently over a long period of time—you would see that kind of work. We would be able to talk about that. So it is much more directed I think towards your interest than, we need to be able to discuss the work, we need to have the piece in front of it and talk about how it comes about and what kinds of games have been played. I think the advantages of a more formal approach if you like, a rule bound approach, is that you can really play games when you have got rules.

It is Wittgenstein's arguments about rules: If you want to play a game you need some rules. You can play according to the rules. You can become an expert using the rules. People begin to appreciate just what you are doing and get enjoyment out of that watching the game being played. At some point or other you can, as were, break the rules which basically means instituting a new rule which basically means introducing something else.

If you play, as it were break a rule, you are going to introduce something else to take its place. I've always felt very strongly that you can clearly use it reflectively in terms of an analysis of works and so on, but you can also certainly do it the other way around constructively. In fact most of my interest in any kind of formalism comes from what I wanted to do as an artist and the aesthetic pleasures that I get out of doing certain things. Its got nothing to do with, its not being

interested in the formalism as such, except that if I find some pleasure, some aesthetic interest in doing something, I want to dig deeper, to find out how it work.

In digging deeper and finding out how it works, one might get involved with mathematical descriptions or computational descriptions of the system, but that is not where I start. I start from some aesthetic experience which in my world I do through various games that I play with some rules that I set up a long time ago and which have been transformed since. But I know what I am doing and as I try and develop that I ask questions which take me back into, if you like, a reflective mode. Does any of that make sense to you?

Yes.

You would need to see what I have done, aesthetically as in some ways it helps me a lot to see what you have done here. Did you ever come across my paper on grids.

Which one?

I wrote a paper actually it was in the time that I was at the Royal of College of Art on a collection of grids which are based on a very simple proportional arguments and so on, which are really quite fascinating and I use those in my paintings all the time, as a underlying sort of rhythmic structure that I play with.

But before you decided on the rules that eventually were built on, the aesthetic pleasure that you were talking about that goes right back to the starting point, could you articulate that then or was it just a matter of taking something and starting it.

It really was simultaneous, there was, when we worked with Phil Steadman on geometry and the environment for example, which was in the 1970s. It was much later than when I started my artwork. The artwork already looked forward to the discussions.

The question of taking—I am something of a minimalist in my starting point in that,—that, Mondrian could put a stripe down on a canvas and somehow seemed to make it important, I found that fascinating. I started arguing that it was like a composer striking one note. What happens if you strike more notes—more stripes, and what happens if you intersect these,— you start playing with symmetries... a lot of my work was done with a musical analogy.

It was done because I knew a lot of composers and musicians when I was at Cambridge, more so than architects, they were much more my friends. We were all coming back from Darmstadt with Boulez, Stockhausen and drawing matrices on table napkins and filling them with numbers and so on, all the stuff that advanced Serialism was involved in.

It immediately struck me because I had a mathematical background but I was also a painter, well why not do this in art. Surely if we do

this in art we can develop expressive modes which in many ways are more expressive than the simple stripe on a canvas and perhaps much more approaching say, Mondrian's *Boogie Woogie* or New York city, that is, you get a very strong expressive sense out of such works using very limited means, basically the stripe and some primary colours. I started out like that.

As you develop you think well yes, is this all, do I limit myself to the primary colours, why do I do this why do I do that,—can't I elaborate these systems? My art career which is essentially a private a career, has been exploring these issues, and gradually you can see a pull away from work coming out of the Mondrian type of approach, people like Max Bill etc, into something which is much more complex. But still there is a relationship because they belong to the same family. You can see the developments.

My ambition, and these are works I have not executed, are more calligraphic, but I think calligraphic in the Islamic sort of geometrised calligraphy, not the free flowing pen type, but the tiling etc where you get a marvellous kind of energetic configuration. I want to do that an change scales on these. There are people who keep saying they want to see me free up a lot more than that but (laughs) I am not sure... I am interested in how expressive you can be if you don't free yourself up. (laughs) It seems to me that most people recognise strong expression if you just let yourself go, but I am interested in keeping total control over the thing and yet in a formal sense, be very strongly expressive. I have not got there yet but I think one can see enough expression in the works.

I didn't start off with grammars. It was about ten years after I had my exhibition, the only public exhibition I ever had at the Institute of Contemporary Art. I have never had one since because I have never found I had wanted to exhibit somehow. At the same time there was an exhibition of Larry Poons going on.

I was later that I, over a ten year period when I was at Cambridge, when I was at the Centre Ann Newsomberg formal Studies, we were doing mathematical work in architecture and urban systems and then it got the point of writing up geometry and the environment and doing a library search we came across George Stiny's shape grammar paper of 1971 which was published in a volume of computer papers of the year. It was on shape grammars with James Gips. I didn't entirely understand it at the time even though at that time I had got a copy of some of Chomsky's formal work, not the more general stuff that he wrote, and was fascinated by the way he was trying to describe and deal with grammatical structures.

Chomsky has moved all over the place doing phonetical material. George Stiny would not take anything from him. George's reaction to his classes with Chomsky was that the man was wrong and he was wrong because George has this very strong visual sense of

things. He could not see that you could cut up visual material in the same way you could clearly cut up written verbal material because you have got these isolated things, these letters. It gets a little bit more complicated in phonetic material, but even there the linguists have these phonemes so you have these bits that constitute the whole. The whole point about the shape grammars is that there are no atomic bits. And that is the whole point about it.

Would you say there was such a thing as a "viseme"?

No, George would absolutely deny the existence of a "viseme". I would deny it conceptually, there have been arguments on visual perception which basically argue that there is a limit to what you can see. That may be the case, I don't know, but I think that if there is a limit, it is highly unlikely that you would see it. In other words, you are usually looking at the wholes, the complete pieces and then you are involved in some kind of parsing if you like of those pieces, which is matter that you do a decomposition if you like and as you decompose.

I mean in the case of figurative art you actually pick out a face and a leg and a horse etcetera, that is, those are the natural decomposition you do when you are seeing a figurative piece. It is more difficult to pick out exactly what you see when you see a more abstract work. Then you might be involved in the kind of Gestalt, sort of, that certain pieces seem to cohere, to form a sub-shape if you like a sub-piece of the whole. And then as a result of seeing it that way you identify certain relationships which are basically the things that give you the enjoyment. It is the relationship between the parts within the whole that you enjoy.

There is the old thing about the figurative painter: what one enjoys is the direction of the eye, the gesture, the movement, the way the foot is moving forward etc, all suggesting interaction between the various elements and that these lines themselves become abstract lines which give a structure, a formal structure.

When you go to more concrete type of works, you are left with—well what are these gestures?—it gets back to the calligraphy in a sense. There does surely have to be gestures in the work to suggest the way your eye might scan it, for the discovery of relationships.

I have no problem with the statement "Design is computation".

Well what is art?

I have no problem with that being computation as well! (laughs)

There is a difference though, it would be difficult to argue that case in art as we see it. But it is not so difficult to argue that case in the case of music. If you look at the most significant musicians,—a conductor friend of mine has just written a paper on *St Mathews Passion*, and he discovered that the mathematics in there is remarkable. I

have been working on Palladio in the same way and that is quite remarkable, in ways that almost everybody has written on Palladio and not seen, partly because they have not had the conceptual apparatus to see it. You need the apparatus of Renaissance, Arithmetic and Geometry, you need to look at it in the same conceptual way that Palladio was perfectly capable of looking at, he was known to be a very fine mathematician so you really do have to sort of say let's take this seriously.

If he was that good a mathematician what would he have read, what would he have known about, who did he talk to. Now, let's look back at his work and see what we find in it and what you find in it is extraordinary. It's just wonderful games being played.

So, grammars are great for analysis of the past is what you are saying. But what about generating ideas?

Well, no I am not saying that, I don't think I did say that, because the two people I've just mentioned are the generators and what I am saying is that if you look at their work it does appear that they really had highly structured ways of generating this extraordinary original material. If you look at somebody like Schoenberg who certainly did the same thing and played all sorts of fascinating games with numbers and structures and so on.

Could you name some artists? Some artists, designers, architects that would use grammars and computation that you are aware of which might be worth following up.

I don't think I am aware of anybody. I don't think so, not in that sense, not in where you put the question, I suspect we've had students here, who have become architects and obviously have done their thesis projects using grammars, Terry Knight will be able to show you some of that or tell you about that, and they have gone on to win national awards, but they've never been able to say that they have used grammars to do it. This would have probably thrown them straight out of the door if they had done.

They used clandestine grammars?

Absolutely, and the works look like any piece of deconstructivist student work that you ever want to see. It certainly doesn't look as though its tight-assed, because they had these rules, I mean they've used the rules to free themselves in terms of the exploration of possibilities and so on and so forth, and some of that stuff is very good, so I think these are early days to see formal explorations really being used, a generation is beginning to develop, it is a small group of people of anyway. [End of section]

[Resumes at noon, following day at Lionel March's "How House", Los Angeles. Maureen Vigler (MV) joins us. Lionel shows early papers and his art]

This is called "Serial Art", it is two pages long and it sets out the principles on which I've produced these, February 1966, *Architectural Design*. The cover design really has my design on it as a public design. You should write that down, do you want to write it down in your book, because that will give you far more information in those two pages than I could ever give you than just talking about it.

[Lionel shows another paper]

The other paper that follows on from that is this one, which is this one, it is called "A Class of Grids". [*Environment and Planning B*]. It sets out how, and then you can see these different coloured rhythmic structures, one, one and so on. These are the grids, and they themselves are quite extraordinary in the way they have or some have a stable quality and others a very unstable, I mean visually unstable and sort of done out of these slightly different proportions. So if you are interested as you said in Tartan grids and so on. They all came from here, this is where I started from Paul Klee's *Pedagogical Notebook*.

I've wanted to see that, it has been on my list for about two years.

Maureen and I were brought up on it. It is just so rich of ideas, but what you have to do is follow through on the ideas, I mean he just sketches in, really just sketches the whole lot in and George Stiny started off these great shape grammars with *Pedagogical Notebook*. a sketchbook, he started actually with one he likes, I used this because I do it all the time because that is this one, these here. He particularly likes this one because this is a movement of two lines around a line that has been taken away.

MV Oh the absent presence! [laughs]

That is how this music in the Renaissance bought **Horsell Bodoni is written in a grammar exactly like that. Everybody knew the Gregorian Chants, so since they knew it they would play around it but would never state it. So the Horsell Bodoni music is this music in which the Gregorian Church had never heard and everything goes around it. It is wonderful, this idea that you have is kind of, these almost standard things which you make use of.

MV Welsh, folk music in which the musical accompaniment is quite different to what actually is being sung, because it is behaving in a very different kind of way. I can't describe it exactly, because I have absolutely no idea how it works, but I know that is what happens.

That was the thing about Ed Moses' work, [paintings currently on exhibition at Los Angeles County Art Museum] it was the absent presence, well, one implied that there was such a thing, and that is the kind of thing I am wondering about. I am wondering whether grammars have sort of done that for Lionel as well, that there is some end product out of all of this reflection and

development?

Well, there is an end product. As to whether it is,

Superior?

Well, we will say whether people are interested in it or not.

I think it was in Munich I saw the last time I was travelling I saw a Paul Klee retrospective. I was amazed at the size.

Belle Pasheer who was Paul Klee's agent in the United States in the 20s and 30s lived in Schindler's house, so she had Paul Klee's, Kandinskys, Jawlenskys and the American, Feiningers's works. Her own collection is now in the museum in Pasadena. It is a fabulous collection of Klees and Kandinskys so all these people knew one another and this so called European avant garde, many of these people actually had their products here in Los Angeles as the film industry was developing and so on, it was fascinating.

Let's go back to your work as an artist, could you explain how you started the background, perhaps an example what was the key instigator for this series of works that became a grammar.

Well, actually the original idea came from my musician friends and they were, in those days, I suppose in the late 50s, Darmstadt in Germany was the centre of the avant garde musicians and so on and they used to have an annual reading there. My musician friends would come back and tell me how musicians were thinking about constructing music, composing music, contemporary musicians and this was done using various kinds of graphical and mathematical techniques, constructing matrices and putting numbers in and so on and then joining these thing up and getting kind of very elaborate patterns.

I started reading about this kind of musical composition, people like Stockhausen, Boulez and so on, started writing eloquently about what they were doing. It was part of what was called Serialism which had been started by Schoenberg and Webern and was called the second Viennese School. I just became very interested, I had been, I was a mathematician and I was then doing architecture and I became really intrigued by the methodology which these musicians were using to produce these aesthetic products and these expressive products.

It seemed to me that the visual artist ought to be able to do very similar things, and why not. There was a play on symmetry on different kind of scaling techniques they were using and overlays of different scales to produce new patterns, all kinds of things which were very understandable to me as a mathematician which were easily translated into graphical or visual material, pictorial material.

So that is what really fired me up, I then actually was designing book covers, paperbacks for the Cambridge University Press, they

had just gone into paperback so they wanted these fancy paperbacks and design and I did some scientific and mathematical series and for one of them I developed a design which used sort of plastic strips and I overlapped and cris-crossed these and I designed what I called a "Series" in which these elements were arranged vertically.

So then if I turned them around and then went this way and then I turned them around and went that way and so on I could basically get overlapping designs. If I changed the colours of the stripes, if I used some of the stripes to erase, not just put something in but take something out, I began to find that I could develop very interesting designs, they were rectangular across and were very reminiscent of Mondrian and to some degree some of the works of Max Bill, and so that really first started off with colour designs I was then invited to give an exhibition at the Institute of Contemporary Art in London.

I made up some very large works using plastic and plastic film on plastic sheets actually so I wanted a kind of industrial approach, I wanted a hands-off from a point of view of the sort of touchy feely, I wanted to deny myself that opportunity so that if there was anything expressive in this, it was coming out of the structures that I was using and not out of the surface, not out of materiality, all the things that painters can use. I denied myself that, and these were quite striking images anyway.

What year was that?

It would have been 1965 probably, the article on Serial art came out in *Architectural Design* in 1966 and that was provoked by the exhibition, they wanted to do this and in doing that they invited me to do the cover design and that cover design was called "Revolutions around a Square". They did that, then about a year later the RIBA asked me to do a cover design for their journal which I did which used various kinds of transformational techniques in a very simple design, so some of it started out kind of like as graphics but my real interest was the expressive possibility in the visual realm of what musicians were doing in the realm of music in the realm of music. in the orb.

Did Noam Chomsky's work come into it at all along the way?

No, at that time I had certainly had read some of Chomsky's technical work, some of the research he did for the American Navy and things like that, but most of that early work on linguistics was concerned about was automatic translation that's really what the military was interested in, could they translate all this stuff very rapidly that the Russians or anybody else might be communicating in so military really backs very heavily Chomsky's early, very strongly very theoretical work and these papers were being published I think in year books like Mathematical Psychology or something like that you know.

So I was interested in at the same time in mathematical applications in the sciences seeing how all that was developing and then asking myself why aren't we using the power of mathematics to think in the arts, in architecture, in urban design and so on and that led me in to the work we did at Cambridge and setting up a centre to investigate certain architectural and design issues from a mathematical view. As soon as you did that you were involved in computing, because the mathematical models you developed for complex things could only really be worked out in particular instances by computing so you went through mathematics through computing, computations in a sense of setting up the programs and writing the programs to the final act of computing with specific numbers and quantities and so on, on specific cities or on specific buildings or whatever else it was, so this just led you back to approaching the arts if you like from a highly generalised point of view in order that you could apply what you'd learned or what you're thinking about in particular instances.

How did the idea of rules and grammars develop in this work?

Well, in my own art work the rules essentially that I was adopting were the same rules that the Darmstadt musicians, composers, we'll say people like Stockhausen, Boulez, Dipicolos, Nono, and all the Italians and so on, there was a whole, Messian in France, were doing this kind of, some kind of rule system each basically producing a rule system that suited themselves and their own expressive needs, their own compositional requirements and yet there were some common things about that, the use of symmetry, the use of scaling techniques, the use of certain kinds of transformations.

Is that what Klee was doing?

Music is kind of like a line, it's one thing to have symmetry along a line and transformations around the line but in painting you have got a two dimensional field in which you work and of course in architecture you have a three dimensional field so that the symmetries, the transformations gradually become richer and richer as you move through these dimensions, but that was the whole point of it: if musicians can do so many wonderful things around a line, effectively the time line, the duration and so on, surely we could do it.

Show me an abstract work of art that has the power of Beethoven. Why can't it have the power of a work by Beethoven, it's got more dimensions, you can do as much in two dimensions than you can do in one dimension and I don't find works that powerful. One can stand before Jackson Pollock and it is powerful and wonderful and you kind of get absorbed in it but it just doesn't do what Beethoven seems to be able to do, or most, many musicians are able to do.

How about Malevich or Rothko?

Well Rothko I think actually is, I am a great admirer of Rothko, Rothko you probably know was also a mathematician, he started off

as a very good mathematician but I think Rothko was doing especially the end of his life what I totally denied myself when I started off with these plastic paintings as it were, because what you get in Rothko at the end is marvellous use of the materials, provocative use and the colours and the sort of shadings with the fuzzy edges and I insisted on the sharp edge and people kept saying to me well why don't you soften, you could be so much more expressive, and I said no, no because I want to be expressive without doing this and I've always seen in the long run if I were to at some point really mature that my work almost certainly would move towards Rothko, not Rothkoesque I mean I am not talking about starting to imitate Rothko, but the way that he was able to have in a sense strong geometrical forms and yet let all the edges bleed away and meld into one another with such, it just so powerful.

But not as powerful as Beethoven?

I don't think so. I mean I have stood in the Tate Gallery with the chapel and the four walls an so on, it moves me but it doesn't equate to Beethoven,—nor does one have quite the memory, it seems to me that the structures the musicians use are highly memorable. I have done this with my students from architecture and said, "Experience a piece of architecture" and you take them back to the studio and say "Well now draw it", and they are quite incapable of doing this.

Now you can take musicians and you can just play them a piece of music and say "Well write down the theme or write down this" and they are usually able to do it, it maybe the lower dimensionality in the sense of music that it is more possible.

I think we do think linearly and it may well be that our memory is much easier to handle when it is a linear sequence but many two dimensional things, three dimensional things, if you show to somebody and they really study them and then you take them away from that and you ask them to draw it or record it their recordings are usually very crude which suggests to me that we don't educate the visual artist in the same way as musicians.

I mean musicians have all these exercises. They listen to chords being played and they have to analyse that cord and know which notes are there, but to you and me probably we are not trained in this it just sounds like a sound you have no idea where you start but musicians can quickly pick out you know, they have names for everything, 13the, 17the, 7the, the this and the that you know, the augmented, the diminished they have very precise language to describe exactly what they do. We tend to use our arms all the time and wave around and say well it's sort of horizontal or vertical and there is no precision about any of these gestures compared to musicians.

A musician can talk about rhythm and he's got it he knows what he

is talking about, he has numbers he puts on rhythms and he knows how very complex rhythms like Stravinsky uses are structured.

[resumes discussion about Schindler's design of the How House]

There is a strong symmetrical interior which is the living room and the study and the dining room but then there are appendages and entrances not the same as the kitchen, so the entrance is dealt with differently from the kitchen and the relationship is different. So these are what I would call *contraventions* I mean they accept a lot of the classical discipline but then do things which no classical architect would do.

[March discusses early work]

Oh that's 1961. They almost look the same but you can see that as I am shifting these are different grids, same design on different grids. If you are interested in that.

What year is that?

I think that's 1966, that was for the RIB in January, that was the cover design for one of the issues. ? That's a modern version of poetry.

What techniques did you use to produce your images?

This is just the technique that I used to use to create the sort of original designs. [looking at and arranging plastic grids] What you have is a rhythm where you can see the different intervals and so on, this is set out as a series but then you can place that rhythm on a field and start getting your first design which is just some stripes. But then by rotating it and by moving the in fact this one is the same you see, but now I can place it like that and I get a design, but if I were to replace it like this I'd get a perfectly symmetrical design because I have got two designs one going left to right and one right to left. Then I can introduce other elements say like this or like that. And then I mean you can introduce a white elements for example and depending on the layout that you put them in say you begin to build up a more complex design, introduce some colour, stripes or something like that and as you can see the final result might be really quite, well let's just try this one and see how this works, for example I mean this is very crude but we are getting together design now which is pretty well all white but has these sort of little elements in black and yellow and probably could be some red in there as well.

[shows early sketch for a large painting on the living room wall]

So this is a sketch which eventually was used in this painting, because you can see that this design does not appear exactly like that this is now in a purple and blue here but this element has been shifted right to one side there's a transformation taking place. Or for example this red ? that appears there, this part of it has been taken over and placed here so it is as if you wrap this thing round and

then you start off with this then there's a ? and that's what you get there. On the other hand this piece is very much the same as you see it there with the two little stripes and thick blop in the middle but that one doesn't get trans....but on the other hand this one gets squashed and this one gets stretched, this one gets stretched so you can see the stretch. That one remains the same and then the orangey one gets squashed?

So could you tell us just a little about perhaps the conception and development of this.

This one [large three dimensional construction with inset paintings] when it started off like the one you have just seen with actually its plastic strips with coloured tapes and then I would convert that to a sketch as you have seen in the previous one and then finally play around with the stretch, change the scale of things, introduce some new elements which are related to the original idea, so you will see here for example the rhythmic patterns and there are three distinct rhythmic patterns each which characterisers the design that you have here or here or here with these little elements. This is one of those works in which the field really dominates most of the activity if you like is erasing the tape so that you only have a little fragment left at the end and there's a little piece like this for example which just sort of sits there and is quite complicated in itself. It could almost be a painting in itself.

How do you change the rules and why would you change them in the development of work?

Let me just take a step back because I think the rules that I use are probably if you take a shape grammar point of view there not rules in terms of what shape grammars or people ? What I do basically are transformations. My rules can be written down in shape grammars rules, they are very simple if you do because all I am saying is basically I can take a field and I can put a stripe in here and then I can put a stripe a distance from that so these are not very complicated rules but you could write them down as shape rules but really the whole emphasis on my work when I started and even now is on the transformations, I like to play with symmetries, I like to stretch and pull things so you get metric transformations, I like rhythmic structures and I like to play with those, so you could have one, two, one, two, one, two but you might have you know one, three, one, three, one , three or two, three or two, three being the sort of intervals in between the stripes whatever else and then you could really start playing around and you have one and two, one, three, one, two one, three four, two one and so on which are built up in my stuff out of sort of very simple structures are my series that a person like Schoenberg take the twelve notes and organises them in a particular sequence, he builds up his twelve note series which he then uses subsequently through the whole composition. He may turn it

around, play it backwards, he may turn it upside down, invert it, and he may turn it around and invert it so he has these four symmetrical operations.

But I have more symmetrical operations when I set my series up because I can move along while Schoenberg can also actually move along, he can start the series off at a different point so he has twelve different series by starting at any one of the twelve notes, and I do the same with translation along my series I can start at any point in the thing, but then I can rotate it through 180, and 270 degrees and I can reverse it and turn it around.

What drives those changes?

I mean what tends to drive it is that you kind of construct something that seems to be of interest, it's usually something you haven't done before, precisely, I mean the system is there but you are sort of interested in what would happen if I used this kind of rhythm as opposed to that kind of rhythm.

You can do some studies as I did in this article on a class of grids which if I can find it wherever it is, yes here we are, you can actually just take basically three dimensions and build up complex grids like these and you can do this as a study as a general study, I mean you just simply exhaust the possibilities and then you have a catalogue and you can start looking at this catalogue and say you know I like this one because it is completely uniform but I like this one because you know it's got it seems to be almost uniform but it has a little bit of variety in it or I like one like this it's more like a tartan.

And each one suggests a different kind of mood, some seem to be rather formal and sort of serious if you like and others seem to be a little bit more humourous and little bit more witty and the point about the musician these are equivalent to various rhythmic structures a musician might use along a line. The trouble about the visual arts is we don't have all the works. I mean a musician will say oh yes and Brahms is ... he uses this kind of rhythm and I really like that and I kind of that inspired me to reuse that in this. They have got the catalogue out there in the music. We don't have these catalogues in the works of art because we have not been doing concrete art abstract art, counter-kunst? Or whatever you would like to call it, we haven't been doing that kind of art long enough for there to be a rich enough ....yes right.

So I mean the way I do it is by generated this stuff now that's grammatical, it's a very simple grammar in this case, you generate this language of simple rhythms. I could have gone on and gone up to higher numbers but the problem about that it seems if you start going above the number seven which is a kind of curious number to stop at but if you go above that you multiple the numbers of possibilities increasingly and they become less and less differentiable. I

mean you can't tell the difference. So yes you can go on but it seems up to about seven you could really distinguish the different grids. But there's nothing magical about seven but its just simply that seemed to give me enough variety to work on.

With your painting and with your work with grammars can you say looking back that grammars have offered anything exceptional as far as insights or consciousness are concerned?

Well, if you were to say which I have never actually claimed, but if you were to say that my work is essentially grammatical, I mean we could always do it in reverse. We could write a grammar for the work that I do. I have never used a formal grammar to produce that work. I have used the ideas of these transformations to produce it and I have had some kind of system which you know I didn't think of as a grammar when I was doing it so say it can all be translated very comfortably back into a formal grammar. But I have these systems. Now what I have found is that the system itself, thinking about it invites exploration.

It suggests why don't I try this, why don't I think about that and I can go around, I can be driving in, you when I was in England or here I can be driving along and constructing a work of art in my head because just like a musician can because I know I can navigate in the space using these systems and I can think and I will sort of think gosh that would be a terrific idea to do that to put these two things together and get this output, that would be very exciting. So then I can come back and write it down. I used to write it down basically like a score, like a musician will write a score down, so it wasn't the work itself but it was the instructions for the work.

Then I could produce the work now then when I take a look at the work I might think to myself, perhaps it will be interesting to try it out with slightly different parameters. This kind of stretching and pulling, this transformation or that I don't know that maybe in some works the vertical predominates in a way that I don't like I'd rather more balance between vertical and horizontal or maybe there is too much balance between vertical and horizontal and I would like to sort of have a directionality to the work and I would like to pull it down in some way or other, either horizontally or vertically and those sort of things the point about that is you know how you produce the work so you know how to change it using the same rules, you know exactly what you have to do in order to move closer to this expressive idea.

I can't remember what I called it now in the article Serial Art, but it was something like the work idea—or something like that that you start out with a general sort of feeling that you want a work that has this kind of mood this kind of expression, has a lot of empty space in it or is very crowded, is lots of scale shifts, is fragmented is altogether, you sort of your emotional life leads you to think about some

kind of work that will be in tune with the way you are living or feeling at that particular moment. And there's the question of how to construct one of these and putting it together and because you know what you are doing, because you are constructing, I think you can get quite close to where you want to be and then you can start doing refinements, you can start getting closer and closer.

I found also that I do this stuff and then live with it and can come back two or three years later and take the theme that I developed at an earlier stage and re-work it into a new work or for the first time into a work, I may just have left it as a sketch and I have often thought of the sketches like a piano piece that the composer might write you know who two or three times down the line is asked by an orchestra to do an orchestral piece and thinks gosh I can go back to that piece that I wrote for the piano and I will orchestrate it and I see the sort of process going from almost black and white drawing or you know as I used to use it the primary colours which I see as my piano works into the full orchestra range, using the full colour range and then painting techniques and so on and so forth in the long run I would like to get questions of focussing which is where we are getting back to the Rothko. You can almost imagine Rothko being a series of rectangles and marvellous colours being photographed and the lens is out of focus so that those hard edges start you know softening. I actually thought of doing all of this with photography at one time, with colour photography and making the colour negatives and just simply photographing the images on top of one another because that's how these things are built up anyway and doing the whole thing that was the next stage after the plastic was going to be photographer but that would have required large industrial type equipment to do it to the scale that I wanted and with the precision that I wanted so.

I am not sure if you answered the question about insight, ie insight—definite focus—sensibility—developed through this kind of activity. I suppose you are talking about the loose analogy of grammars as applied to art rather than strict formal systems?

I think most people will think because if you did write it down as a grammar it would be very strict and I don't move outside the grammar, I may occasionally apply a new rule or take a rule and not use a rule but I think it's pretty strict and what I say I am doing is that I am exploring within that realm the expressive possibilities so and the ability of having an intention an artistic aesthetic intention and being able to follow that through and produce the kind of work that I want within that language the grammar produces so I think. I have always satisfied myself, I just don't know whether other people are satisfied.

Are there other artists, designers or architects that use gram-

mars and computers in an open transparent way? People who have used grammars consciously to produce art, perhaps in the sense of a loose analogy, and in a formal way?

I don't really want to I tried to think about this, some of my art is like Mondrian, the late Mondrian certainly inspired me and there were people like Antony Hill in England an artist/mathematician who did a study of the structures using the structures that Mondrian employed and tried to find out in a sense what was the grammar of Mondrian. That work inspired me, you then come on to the second generation really of people from the Bower House people like Albers who I you know the sequence of drawings that you have like this which are kind of in a way variations on a theme. And I think people who do variations on a theme in this kind of structured way are in a way playing with a grammar there are rules involved in these forms and then of course there were the famous College two Squares series, the grey ones, the coloured ones, that's Albers.

You have somebody like Max Bell who again plays with some of these kind of paintings and forms which the formats if you like are highly structured and plays with sort of thing which I have made of use of in some of my own works this general format, and then you have works like this where you get one, two, three, four, the design like that which is overlapping, because you look at the browns here the one, two, three, four, then the one, two, three, four and then one, two, three, four or feel paintings like this where again you get a certain kind of repetition blending in and merging. I found those works interesting and I guess they are in some ways they are probably works that you could approach them from a grammatical point of view.

Probably one of the most compelling of the artists is Richard Lose another Swiss artist who quite definitely builds up his works on grids with numbers and so one and these are some of his coloured pencil crayon works in which there is no doubt that he is exploring in a very definitely constructive way his works and these are just the sketches, basically, I don't think this book has any of his original paintings in.

And these people are members well up to a point, they were related to this counter-kunst, this cold art, cool art I think of the 60's and I always wanted to take this work forward, it seemed to me that was a pretty job not something that just fashion would determine that it was in fashion in the 60's therefore you drop it. But the issues that these people were dealing with were long term issues of trying to work out how you could develop these techniques into much more expensive forms and there is no doubt that the whole group, the counter-kunst group Carl Gasner was ???? programming and design interesting, fascinating book of the sixties in which basically he's taking an algorithmic approach to design. I mean you set up procedures

for constructing the work which is really as close as you can get to being a grammar, I mean that's really what you are doing.

A lot of the work in the sixties was documentation, serialisation and transformation then gradually in the eighties a lot of the painting was ? to position and in architecture Bernard Tschumi talks about disjunction, strategy all of these things have a kind of element of transformity of grammars. How far can you take that into the realm of form? Is it really appropriate to try and think about it in terms of formal work or just let it go as a loose analogy ?

No I think it is probably possible. My sympathies, my generations and its part of it, was very involved. We were brought up on this stuff and I want to see it develop. That doesn't mean that I couldn't do sort of decon art if I was enthusiastic about that kind of thing I could do it. and I think I said the other day to Terry Knight house students, some of those have been awarded some National Awards for their architectural designs, projects which are definitely decon designs, I mean that's what they look like.

With all these kinds of strange angles and shadow curves and all this stuff that people like Tschumi and Eisenman were interested in and it's all done grammatically, they don't say so because I think if they said so they wouldn't win the competitions. All the time that people think it's being done freely and getting very excited by the products of these students. But these students perhaps could not have produced the work that they produced unless they in fact had taken a very formal approach.

You couldn't take a spatial relationship or several spatial relationships which will definitely produce decon looking works. I mean there is no question about it. You have only got to have two lines which add a very shallow angle as one of your spatial relations and set up rules as to what you do with that shallow angle. Or that you have a replacement rule that takes this line and replaces it by an arc, a shallow arc and before you know where you are you are looking at all this stuff that most of these guys produce, only they kind of produce it, they like these shapes, and they like these lines and like these angles but it's more-or-less done like, well we know it from seeing the work in the studios, they do it by really getting the students to draw as many lines as possible and then select out of this or taking a photograph or taking some other image, a painting or something like that and drawing lines on that which they want to select and then selecting those and turning it into a piece of architecture. I mean that's done and that's a technique that's used.

But you could, as you said, you could write grammars to produce things that look the same as that, there no problem and you would have a lot more control over it.

How does Frank Gehry and Robert Venturi fit into that scenario?

I think they are two very different architects!

Well— taking them separately.

I don't know that they do, it's,—I think what they have done is take certain stylistic elements basically which they are sort of like signature elements which they use in their works to identify themselves as this particular architect, Frank Gehry for example. Now those elements themselves shift I mean over time. There is a building on UCLA campus which is purely rectangular, completely rectangular with corner windows and various other things which was one of Frank Gehry's early works. There's a studio that has just been sold in Hollywood that is exactly the same, entirely rectangular. But there is something about the work that is distinctive not necessarily, if you know your Gehry you know it's that period of Gehry. If you don't know your Gehry very well you might not realise that these are Gehry buildings by what you see today. I think it goes back to Terry Knight's investigation of Vantongerloo where Vantongerloo starts off with very rectangular designs with a grammar which you can write to suggest that and slowly over time you begin to get these beautiful spare curved designs, lines and so on and Terry was able to show the stylistic shift did not really mean the fundamental shift in the grammar, it didn't require transformation in the rules, you write one rule down here and then you transform that rule but you've still got a rule X as it were. Now its X prime. It's slightly different and you still apply it in the same way and total work.

Gehry at one time was interested in trying to use a grammar and I don't know what happened to that, he had heard about these grammars and wondering whether they could do that. There is a different thing which George Stiny and I have talked about and that is when you see fashion designers Armani or someone like that producing suits and whatever but then marketing the Armani style and making that much more generally available, how is it that an architect like Gehry or well take Gehry or others who have a definite signature, Michael Graves for example.

If they had a grammar, they could market their designs throughout the United States. I mean houses or buildings and other architects could take those grammars and use them specifically for a client with their name on. In other words, you have seen it happen in the other design professions and therefore you could produce it so that almost anyone could buy a Michael Graves house.

Now he has just recently I think in *Life* Magazine done a house, every year they get a famous architect to design a house. It's a single house and yes you can have it built, and maybe it's not too expensive because the design is there. But why not a grammar which is piped down the line and people buy into it, it's a franchise, a franchise design. So architect X is not particularly good, not making very much money, you know he's working out of a garage somewhere

some new young student. Takes out a franchise on Michael Graves and starts producing in Beverley Hills Michael Grave's buildings.

Or using this idea maybe you have to send the final design to Michael Graves for his signature and maybe he wants to suggest this change and that change but that's fine. Design becomes public, it becomes democratic. The trouble about design is that it essentially becomes elitist unless you think about industrial design, you know prefabricated buildings all identical. We have gone through that stage. I am talking about tailor-made of the sort of design, off the peg of a grammars, the sort of hard work has been done, it's there in the grammar and that's what a grammar can do because it produces languages in design, it produces many different designs and you apply the rules in different sequences and you get different results.

How important is a rule for breaking rules?

You mention that you were interested in Venturi because of this sort of turning things upside down. In the book on Schindler, I use the word *contraversion* because Schindler was brought up in the classical background and his very early student works is a classical post office, I mean they obviously knew their stuff. And the reason I did that was because if you take this house for example, a classical villa has bilateral symmetry which is orthogonal that is to see the axis of symmetry is parallel to the walls. Now in this house, the whole house there is a lot of symmetry that is diagonal bilateral symmetry so the line of symmetry goes on the diagonal of the square not orthogonally to the square parallel to its edges. And that seems to me a reuse of the classical idea of symmetry but shifting it into a new position and getting a new result. And there are for example classical architecture will always have very strong corners for structural reasons. That is an important fact.

If you read your Palladio and its written in there that the corners must be strong so you cannot put a window too close to a corner it must be away from the corner so that you have got the masonry there. What did Schindler do, he cuts the corner away and he uses the cantilever which is not used in by Palladio. So that's another contraversion between the window cut into the wall away from the solid corner to what we have here which is what we have cut away corners. And you can go through a series of things like that. The entrance in a classical building is on the axis. The entrance in these buildings is off axis. There is a strong symmetrical interior which is the living room and the study and the dining room but then there are appendages and entrances not the same as the kitchen, so the entrance is dealt with differently from the kitchen and the relationship is different. So these are what I would call contraventions I mean they accept a lot of the classical discipline but then do things

which no classical architect would do.

[later looking at early work]

Is this the technique you used for the paintings?

This is just the technique that I used to use to create the sort of original designs. What you have is a rhythm where you can see the different intervals and so on, this is set out as a series but then you can place that rhythm on a field and start getting your first design which is just some stripes. But then by rotating it and by moving the in fact this one is the same you see, but now I can place it like that and I get a design, but if I were to replace it like this I'd get a perfectly symmetrical design because I have got two designs one going left to right and one right to left. Then I can introduce other elements say like this or like that. And then I mean you can introduce a white elements for example and depending on the layout that you put them in say you begin to build up a more complex design, introduce some colour, stripes or something like that and as you can see the final result might be really quite, well let's just try this one and see how this works, for example I mean this is very crude but we are getting together design now which is pretty well all white but has these sort of little elements in black and yellow and probably could be some red in there as well. Can we do it like this? Is that all right? So this is a sketch which eventually was used in this painting, because you can see that this design does not appear exactly like that this is now in a purple and blue here but this element has been shifted right to one side there's a transformation taking place.

Or for example this red—that appears there, this part of it has been taken over and placed here so it is as if you wrap this thing round and then you start off with this then there's a—that's what you get there. On the other hand this piece is very much the same as you see it there with the two little stripes and thick blob in the middle but that one doesn't get transformed—but on the other hand this one gets squashed and this one gets stretched, this one gets stretched so you can see the stretch. That one remains the same and then the orangey one gets squashed?

So could you tell us just a little about perhaps the conception and development of this work?

This one when it started off like the one you have just seen with actually its plastic strips with coloured tapes and then I would convert that to a sketch as you have seen in the previous one and then finally play around with the stretch, change the scale of things, introduce some new elements which are related to the original idea, so you will see here for example the rhythmic patterns and there are three distinct rhythmic patterns each which characterisers the design that you have here or here or here with these little elements. This is one of those works in which the field really dominates most of the

activity if you like is erasing the tape so that you only have a little fragment left at the end and there's a little piece like this for example which just sort of sits there and is quite complicated in itself. It could almost be a painting in itself.

Thankyou.

Philip Pearlstein: Interview by Dean Bruton

Pearlstein's New York studio

16 July 1996

Philip Pearlstein lives and works in his studio as a figurative painter. He lectured at Pratt Institute for many years and has an international reputation as an exhibiting artist.

Would you tell me about your background?

Essentially I have been trying to solve the same problem that I presented to students when I first began teaching which was in 1959 at Pratt Institute. I started out at that time my own work was still very expressionistic and based on landscape ideas. I was given the title for a course without content. The title was "Workshop History of Art". I decided to have students take one image through the history of art. It was a 30 week course so I set up 15 problems and the most interesting and complex was when I encountered the Italian Renaissance with the use of perspective and structured measurable space and I became confused trying to talk about perspective. It was an epiphany. I decided then that trying to solve those problems of not necessarily drawing from rules but using perspective and accounting for all the space in a painting where things were, how light fell on the surfaces and so on. In other words, to take full command of everything and really be responsible for every mark that I put down and that should all add up to a particular kind of construction. It seemed to me to be far more interesting than being expressive, just sloshing around and hoping something would emerge, which is a crude way of putting it but that's more or less as understood abstract expressionism. I know that's an insult to those who work very seriously with those ideas, but from that point on I devoted myself to working this way.

The first variation on this problem that I gave the students, was to do an abstract painting, but not and expressionistic one. When they resolved the problem of an abstraction that was convincing in terms of relationships and colours and so forth. To then translate those abstract shapes into real objects to life objects and the space between the objects trying to come up with a tightly controlled, one point perspective painting of construction following the rules, as best we could, of perspective and turn it into a naturalistic painting.

I learned a great deal from what the students did. I gave that problem over four year period and I used the students as a laboratory for myself and I've learnt from watching them. Then I applied it to my own work and essentially I joined a group of Faculty who were drawing models once a week that we hired, we worked in one of the Faculty's studios. It was for six hours an evening. But I saw the pos-

sibility of using the models positions and so forth, to create essentially an abstract set of relationships—as I understood abstraction.

I have to go back further. I started a degree in art history—a Masters Degree. But to get out of the school I want the city livable for the people. The people do not need postconstructivist or neo constructivist grids rather than square or circular grids or a garden city grid like in Canberra. People need trees which they will not get because the cost of land is too much idea and then you'd spend the next 15 years refining it.

So, my subject was the work of Francis Picabia. It was one of the first papers on twentieth century contemporary art done at the Institute. I got away with it only because he was Spanish. My adviser was Spanish. Dr Lopez Ray, whose particular subject matter was Goya. But anyway he was delighted to have somebody who would work on Francis Picabia.

I chose Picabia because I'd been working on industrial catalogues for plumbing fixtures and stuff like that. I worked at those for almost 12 or more years. I did paste layout for other kinds of publications. When I first became aware of Picabia's work and Marcel Duchamp's work,—they're almost inseparable, for many years. The works of the Dada period using those machine shapes which they took from catalogues. It was very close to home. What made it very interesting to work on was that Picabia went through so much of art history himself. He started off as a young post impressionist and slowly built into Cubism and came up with the idea of essentially Synthetic Cubism before Picasso. Big flat shapes filled in with colour, not fragmented and but linear.

He financed Appolinaire's book on the Cubist painters, which was the first real publication of my ideas and because he was paying the bills, he put in his own chapter and it was his kind of abstract with big flat shapes.

He moved out of that into the Dada thing and from there into early Surrealism. I didn't know his later work at the time. It was all held in some big fight over the estate. He died while I was working on this thesis. He ended up doing kind of Renaissance like paintings. I did not know that.

I had to get very much involved with Marcel Duchamp's development and between the two of them, I spent almost four years on the thesis and I came away feeling I knew everything there was to know about at least early twentieth century abstraction and from that point on I could only be an imitator from one or another aspect of early twentieth century art.

Anyway I became involved as a painter at the same time, with the abstract expressionist group. I used to go the panel discussions they had every Friday night. I tried to make a synthesis of all this. There

were a few paintings including an early one of Superman. Then when I tried to exhibit as an artist, nobody knew what I was up to and laughed at it. It was too early to be a Pop artist, but that's essentially what I was doing: *Superman, Statue of Liberty*, etc. I painted it in an abstract expressionist technique. I abandoned that and just ended up painting rocks in an expressionist manner, looking like landscapes.

When I started teaching, it was hard, largely because of the article that I had published from my thesis on Picabia and Duchamp. Then I went onto write a series of other articles and I was also exhibiting artist in the appropriate abstract expressionist manner. This was in 1958-9. I had this work behind me as a layout artist, which is now called graphic design. So I had these three phases.

I was hired at Pratt, essentially to teach art history, because I had a degree in art history and I ended up with this course: "Studio History of Art", and got caught up on Renaissance, which had nothing to do with Picabia or Duchamp, at least at the beginning. Picabia and Duchamp said all these wonderful things. My favourite statement of Picabia's was that, "Our heads are round to allow thought to change its direction", and Duchamp's was something like, "Working according to the rules of chance". I forget the exact statement,—but letting things happen accidentally became embedded in my idea, in my head. That became a rule. An accidental combination of visual elements.

Also in my background, my last job in commercial art was working at *Life* magazine, which at the time was very big and I spent days—you'd have a whole stack of photographs. The same set of images for every story, but you have to send them out for enlargements or reductions and make up variations on the layout for each story, several variations with the photographs all cropped in a different manner and different scale. At the time it just amused me, but it sunk into my brain and when I got involved with this Faculty drawing group on Sunday evenings, I started drawing from model,—I immediately began applying all these thoughts that sort of came together I saw the figures and spaces around them and positions as abstract exercises. That was my starting point.

I am interested in discussing the idea of rules. The idea of principles in work, because I am interested in this idea of when rules appear to be used when they change, when there seems to be a sudden change in the rules and how much rules appear to carry over from one work to another.

Working in graphic design, you work essentially with a page. The rectangle becomes everything and for years I was working with a pica ruler in my brain. Everything was in proportion to something else. Very simple mathematical relationships, but they were there and I had to use them and follow through.

So I developed this enormous respect for the shapes of the rectangle and everything within it, and what happens is—as soon as you starts subdividing them, even with other rectangles or blocks of type are one thing, or photographs, but what happens when you get Baroque with them, you start using in terms of pictorial compositions.

I no longer have the pica ruler in front of me, in my head, but the idea of subdividing the canvas according to some kind of scheme, has remained intuitive. I discovered that it just happens by itself. I don't have to worry about it. I draw from life it in terms of proportions. I start with one element, one unit, and then just visually measure everything according to that. Whether it's right or wrong in terms of anatomy—the correct proportions of anatomy, I don't care. It's really about the distances from the edge of a form to another.

For example - could you show me how you might have done that on particular piece? [demonstrates in front of a painting]

I always start somewhere where things get very complex. I always start my paintings in the centre, on a pattern and in this case it is where the most interesting overlap of shapes occurs also.

So the initial line would have been this line along the back and then, the horse, the space under here [under the horse] became the dominant element the central element. Everything grows out of that. The distance from that to that and that to that—and coming back to refine this edge and then from that edge now to here, but its all in terms of skipping around and measuring these distances. The distance from there to there and then subdividing more or less along that way.

It's not necessarily measured out and I can keep changing it and correcting it and refining it, but its basically the starting point in finding the shapes really by studying the empty space, this white shape that occurred from the breast coming down there along that edge. Once I developed it this far, this becomes the determining factor of everything else that happens the sizes its of all the other elements - the thickness of the leg from the edge of the stomach to the back. And I just go through the whole painting that way. If this is this wide here and how wide this is from the back to there and so on. It's just freewheeling measuring.

Then at a certain point logic has to take over. One of the things I learned in teaching, trying to teach a perspective—which I never did a persuasively because I was always trying to connect it up with vision—and you can't. Correct Renaissance perspective has nothing to do with what you actually see. It took me years to learn that. I think that's Cézanne's basic hang-up also, and why he was always unhappy with his pictures, because he was going from point to point and then trying to get it look *Renaissancey* and it doesn't work. It's always out of wack. Some people see it as great design but I think it

was largely accidental.

At a certain point I had to start correcting things in terms of perspective. Are all these parallel lines going towards the same vanishing point? They don't have to do it exactly. They just have to be going the same way, and if I wanted to define the space, on this floorboard it has to go to the vanishing point that way and relate to the way these lines move to the same vanishing point. So I will make that kind of intellectual compromise, which might disturb a lot of people, but I think I owe it to the painting to give it some visual logic when an audience looks at it.

Essentially its like a jigsaw puzzle - given that shape I then develop all the other empty shapes and I discovered a lot of course, bonding elements after I get started. The fact that this line is echoed by that line, is something I like. It happens accidentally, but its there and so eventually I guess I'll push it a little, while still trying to stay true to the form. It just becomes another variation of that kind of wiggle, but in a vertical way. And there's a series of vertical divisions that almost accidentally becomes kind of a grid. And then there's the use of perspective again to get the dirigible look like it's coming forward. I have to say I did learn something from the use of a stereo-optic camera, which I bought—old 1930s camera, which was called the Stereo Realist.

Could we see the camera?

This is a Stereo Realist camera - mid 1930s. [showing a stereo camera] It has two lenses and it takes—this is a nineteenth century photograph. I didn't take it. The results are essentially the same. You have to look at it in a viewer and when you look at it in the viewer, everything pops into a three dimensional spatial relationship. It's an exaggeration of what you see in nature, but nonetheless, it hits you over the head with the effect of three dimension. They only work if you get things lined up in such a way that they overlap, because its the overlapping that you see that gives you the stereo effect. Everything else more or less gets reduced to planes.

The camera has a wonderful field of vision. You have to pick on a certain point in the scene you're going to shoot and it has a split view finder. You have to line up the view finder so if there is tree trunk in the middle - you get the tree trunk to line up. Then everything is seen as in front of, or behind that tree trunk. But you can pick that spot in the picture. Its sort of amazing.

After I'd got hold of it, which was 1982, I took it with me to Rome. I was artist and residence at the American Academy in Rome for three months. I went through a lot of Roman ruins, photographing them with the stereo camera. I had a great deal of fun with it, but I learned a lot. I should emphasise I don't work from photographs. I learn from photographs but I have never painted from photographs.

Except once I did a portrait a few years ago of somebody who was already dead. There was no choice. He was a famous art historian.

So I developed all the paintings in much the same way using stereo photographs and taking my own. The idea of depth of field in applying those to my own work having overlapping, a an emphasis on something overlapping somewhere in the picture and measuring points. So far we have been talking about setting up the composition or drawing the composition on canvas. I have been concerned primarily with the side to side measurements but at a certain point I have to start dealing with the three dimensional measurement from one point somewhere in the composition things come forward or move back. That is a little more difficult because it becomes like three dimensional chess or something. It is something that is intuitive—that's essentially when colour and tone relationships come into play and varying the intensities of colour.

When I started working naturalistic way, I had to make a decision about colour as an expressionist colour can be anything and any kind of intensity. When you work from life, from nature, you have to have colour that takes its position in space in relation to the whole scene. It can't be arbitrary. It means accepting a lot of grey very uninteresting colour. But the colours that I use are usually always based on what I see, so that becomes part overriding aim—duplicating what I see in terms of colour.

But it doesn't mean learning to accept colour in another way, other than for its own sake. But I learned to use it. It's amazing even a colour like raw umber when you become sensitised to it, you can make it more intense or less intense - cooler or warmer and so it assumes a position in space. I work with colour that way. Even greys, a whole range of greys can become warm or cool or intense or dull in just the way you might think of any other more primary colour. I use that to establish the three dimensional scheme of measurable distances.

Can we talk about sudden change in your rules and how much rules appear to carry over from one work to another?

The only sudden change. When I started working with the figure in the first 7 or 8 years. The paintings were large scale the figures were over life size. The figures dominated. There were a few simple props like chairs, beds—then I gradually introduced, oriental rugs, American Indian rugs and so forth—Japanese robes as a way of breaking up certain areas into smaller units—more complex designs and as a way of bringing other kinds of colour into the painting.

When I moved into this place, which is now 13 years ago, there was a big change - that's when I suddenly started using all this stuff that I had accumulated and collected over the years. That was also after I had used the stereo camera in Italy. It was on my return from that

time in Rome, that I became involved in using these objects as a way of making everything much more complex in terms of shapes and colour; the relationships and gradually they have become as important as the figures in the paintings.

Is there something in your mind before you start, that you're looking for? Is there a mood or a concept?

No. I always expect that what I am working on will be the last one I'll ever do. I think that's an unfortunate left over from being through World War II. As a young soldier I was always painting on my own time whenever I had it, making little drawings or water colours. I always expected it to be the last. Anyway that is always in the back of my mind. I don't know what that means.

That would drive you to do your best for the current situation, wouldn't it then?

There's always a sense of starting over as well as being at the end, it's also starting over on the next one.

Is there a set of relationships or a mood or a feeling, or does it just develop, that is, the style? Could you could refer to it as a Pearlstein vision? How do you get to that? Is there something that you recognise now that you have done regularly that contributes to the establishment of your particular style?

I've had one man shows regularly. I've been very fortunate that way. I've always been represented by good galleries. I've had one man shows in New York on an average of either 18 months or every two years. You don't need much work for a one man show. Just a half a dozen or nine or ten paintings at the most. They've kind of marked periods. When the work goes off for a show, there's a sense of starting over. I know that it carries over. I mean all my habits come into play all over again but its like figuring them out all over again. I guess the changes occur at that point. Whatever changes do happen because I start a group of works. Right now there are four or five going at the same time and that is half a show. The painting that I am working on now, though they're not small, they are smaller than the works of one in my last show on the average. I try to make that as complex as the larger paintings, and as dense. I guess I've overdone it. In some cases they are a lot more dense than I expected.

How do you come to the forms that you use? How do you get there? What's the process that you use to actually decide on what form you put in and what form you leave out?

I know I am going to be working with models. I know I have these objects around and these models. The models are, to a great extent, are responsible for what goes on in the painting. So the models have

to get into a pose that's interesting to me, but that they can hold and be comfortable with over a long period of time. Then we start playing around with these objects and they have to relate to the objects. They have to work too.

In this one for example. As far as the form goes when you are arranging the forms in the picture,—what sort of rules or decisions what you've made? Is there someway that just feels right, or is there more to it than that?

No, I become aware of relationships after I start working, but more or less just happens by itself. But as I say this at this date, I have been through it enough times, more or less to know that whatever I set up will work and if I just change my position from one side to the other, it becomes arbitrary.

That's what I've been doing more and more: keeping the same setups and maybe changing models or the relationship to the models, that is, the woman to the objects and moving myself around. So these new works in a sense, are serial much more than previously.

Are there other artists you could think of that particularly relate to that idea of rules and derivation of rules in their work?

I have one friend whose work I follow, that is Al Held. I don't know that there's any real overlap between his work and my work.

I think he uses rules that are very intuitive, same kind of intuitive way not articulated. I am sure he could articulate, but just from studying his paintings you can see his infinite variations on a few ideas.

Do you use computers as a medium and if so, what was your experience?

I did use computers extensively during the course of one year. Someone did this video on me for my teaching ideas. Now, it is in the pre history of computers. They change so much. But it was a wonderful machine called the *Full Paint* machine and you could ask it to do anything you could think of, except it didn't do the animation or three dimensional rendering—it didn't revolve things around. I approached it as a graphic medium, the same way I would approach etching. Maybe that was wrong coming to it with preconceived ideas, but that's what I had to do. We were paying for time on the computer. I had to get results, so I just thought of it as a variation on full colour, aquatint etching essentially.

I loved it. I kept thinking that what was the most fascinating part of it was the kind of built-in animation that is where you can watch your lines, colour areas grow. And the fact that you could manipulate them as separate images and superimpose all these different stages in new ways. It was wonderful. It seemed to be the perfect tool for an artist like Rauschenberg. I don't know that he's ever used

it. I suggested it to a couple of others friends, who I thought would find it useful, but they weren't interested at the time.

Is that a kind of anti computer ethos?..

If you've grown up in the traditional art forms, I guess there would be, but I've had all this experience doing graphics, even working on those industrial catalogues is essentially no different. We had to do colour overlays, colour separations by hand. at that time it wasn't being done photographically. That's the kind of thing I was doing.

I was looking at Rembrandt and the qualities that we talked about where Rembrandt tried to communicate the inner soul of a person or an *otherness*. One of the claims some people make is that one can gain a deeper sense of consciousness through painting, or that through working with grammars or through thinking about working through image-making in a reflective way, one can actually come to deeper insights about self identity and things like that. Do you think that painting has done that for you? Is there a broader awareness, or a deeper insight to consciousness to understanding that you have developed?

No, but I am concerned about it. I think it would be news to Rembrandt. I don't think that was his aim.

So its a much more formal matter of fact "work as usual" kind of approach and there's no pseudo intention about it?

No. I think communication is very complex and then there's the society you have in New York City anyway. What segments are you going to try to communicate it with. Most of the people working in this neighbourhood which is the garment district fill the streets. Sidewalks are crowded all day long with Hispanic, Blacks, Chinese, pushing these carts around. I know what they would think of my painting. They would simply see them as pornographic. They're not the ones I am trying to communicate with. I am not sure who I am trying to communicate with. Maybe just some another artists. I think in our society all these things are up for grabs. Every segment interprets things in the wrong way. You can't worry about that.

Thankyou.

Alvy Ray Smith: Netscape Interview by Dean Bruton

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Alvy Ray Smith works for Microsoft and has a reputation as a major international innovator in computer graphics.

I sent the following questions with a brief preamble as follows:

Preamble

These interview/questions are necessary to explore the idea of a "contingent sense of grammar", to provide a first hand account of experience of grammars in relation to the field of art; to assemble a view of the directions of shape grammars and other strategies for the development of art and design education and practice. My PhD thesis demands knowledge and understanding of both a loose analogy of grammars and the formalist systems of grammars. Your work is relevant because it illustrates an experienced computer user familiar with the ideas of grammars and computation, who may be able to comment on the applicability of the metaphor of grammars in relation to art and design.

From: Alvy Ray Smith <alvys@microsoft.com> To: "dbruton@dove.mtx.net.au" <dbruton@dove.mtx.net.au> Subject: RE: Questions?

Date: Thu, 3 Oct 1996 09:56:20 -0700

Encoding: 581 TEXT

Here are my responses:

1. My prior knowledge of your work is limited to the Internet projects on the Visible Man and Visible Woman. Would you pleases clarify your role in the art and design aspects of these projects.

The Visible Human Project was instituted by the National Library of Medicine (NLM) while I was one of its Regents (4-year term). I believe that my work with "graftals" is probably more relevant to your PhD subject than the Visible Human, which is strictly a 3D raster of data points (taken in three ways: MRI, CAT, and digitized colour photographs). Not much interesting data structure there. My work on computer-generated plants, however, is language based, using what I call "interpretations" of formal grammar types known

as L-systems, or Lindenmayer systems. See my piece white.sands on my web page under Art for a grammar-driven work of art.

2. I am less interested in grammars as a means of representing the designs of others (in the past) than in the relation between the concepts of grammars and the process of making designs, especially Schön's ideas of "the reflective practitioner". Would you comment on the quality and amount of reflection in action that occurs in your work as an artist/designer (- in relation to the idea of Schön?)

My graftals use a strict formal grammar, but the art in the result is strictly mine. The grammar emits a formal string, but it is my interpretation of that string (of 0s, 1s, [s and]s) that transforms the boring string into an interesting "plant" (nothing like them really exists). I select the colours, the widths, the curvatures, the directions, the lighting, the "flowering", the viewing angle, etc. There is nothing grammar-driven about these choices. Another way to say this is that there are an infinity of interpretations of a graftal grammar string. It is the artist's job to sort through these and prune the infinity down to size.

3. Would you show (image of) some of your own work that demonstrates the following ideas: series, derivation, transformation, rules

See the aforementioned white.sands. This was generated using several generations of a grammar, starting with a single "axiom", namely a single 1. The grammar has eight rules and is context sensitive. So a single "cell" or "segment" of the final plant (my interpretation of the 0s and 1s) changes from generation to generation according to itself (whether 0 or 1) and to its two nearest neighbour segments (whether they are 0 or 1). Some of these transformation rules do nothing. Others cause a branch to form (indicated by a [,] pair). Others cause a state change (0 to 1, for example). Others cause a splitting of a cell or segment into two-i.e., "growth". Note that segments, branching, growing are all parts of the interpretation of the otherwise meaningless 4-ary string generated by the grammar. So each generation is one step in a logical series of plants = snapshots of its growth. A derivation is application of the transformation rules to every cell/segment in the current generation, simultaneously, to create the succeeding generation. The artistic process includes choosing interesting sets of rules from all those possible, choosing the interpretation parameters listed above, and deciding which generations to actually realise as phenotypes (of the string genotypes). If the piece is an animation, this adds further choices: how to interpolate the given frames to form smooth growth, the effect of tropisms, the path and other camera parameters, etc.

4. Do you agree with the statement?: "Derivation sequence according to rules is known as a grammar." Comment?

"Derivation sequence according to rules is known as a grammar." Well, my mathematical training comes to bear to say that the rules and what they apply to and how they are applied is the grammar. It is customary to define the sequence derived from application of a grammar to be the "language" of that grammar. One can derive English sentences from an English grammar, but the sentences are considered part of the English language rather than its grammar. The grammar of DNA is well understood. The strings created are called genes, or genetic sequences, not grammar, which is only the rules used for the derivations. One of the trickiest problems in mathematics and physics is the generalisation of textual notions, such as grammar and language, to graphical or pictorial elements (in case of mathematics) and to actual physical, space-occupying elements (in case of physics and chemistry). Nature has solved this problem for DNA by having the language interpreted (cf. graftals) as proteins, in a manner still not understood completely (the folding problem). One can imagine that a grammar can be expressed directly in picture, or geometric, or even molecular form. In fact, shape grammars of a very rudimentary form are about as close to this as we have come. Beyond that, the math gets very hard very fast. Certain graph grammars have stretched the bounds, but they are in general quite difficult to use. All this is strictly speaking, of course. The art world has often spoken loosely of the grammar of, say, Mondrian, or Picasso, or whoever. In fact, that might be what you are referring to in all these questions?

5. Could you name three examples of artists who appear to work with fairly strict rules?

5. [no answer]

6. I am interested in contingent sense of grammar: when rules appear to be used, when they change, when there seems to be a sudden change in a derivation, how much rules appear to carry over from one work to another. Does this idea seem significant to you and your work?

Ah, I see I have been interpreting your questions much more

theoretically than you mean. Nevertheless, I believe the formal aspects of grammar apply, as I have indicated above. One of my beliefs is that exploration of actual grammars, as opposed to implicit ones, is one of the great uncharted oceans of art, one that the computer has uniquely made available to us artists.

7. Would you discuss one or two examples of your work in these kinds of terms. For example, the .... work. How did you come to that form? .... Do you ever think or talk about "rules"? ..... Were there times when the way the form was developing seemed to change markedly? How and why?

[I don't know how to answer this one.]

8. How do you see the place of grammars in making new designs?—Both as an analogy and as a formal system?

I have thought a lot about the contribution of computers to art. I have concluded that they have fundamentally affected art by (1) permitting artistic control of complexity, (2) separating creative space from display space, and (3) enabling spatial editing. Point 1 is the one to which grammars/languages/computation is relevant (by the way, formal languages and computation are equivalent concepts, as we mathematicians would say). An example of a process of artistic creation enabled by the computer is that used by Karl Sims, called artificial evolution. The idea is that the computer, using some set of rules - a grammar, say - generates a large set of images. Then the artist (Karl Sims, for example, although he doesn't really call himself an artist (he should)) selects some of the more interesting paths taken, orders the computer to proceed on these paths and to cease pursuing others. Then the pruned set of derivations are transformed according to the rules to make a second large set of images. These are again pruned, and so forth. The results are highly "imaginative" images that Karl himself would never have created directly. But he did create them in the sense that he edited the uncensored, uncriticized stream issuing from the computer (supercomputer, so far).

9. When is it useful to use formal grammars?

As I have just argued, formal grammars give the artist control over complexity. A truly rich grammar yields "sentences" of profound beauty in the hands of an artist who interprets them and selects from them.

10. Do you ever use computers as a medium for graphics/design etc? If so, what is/was the experience as a medium involving derivation and rules?

Yes, I have used computers as a medium for art and design for over20 years. I don't like the way you word the second part of this question. It seems to imply that using computers is equivalent to using derivations and rules. This is not generally true. It is true, of course, when explicitly using grammars as I describe above for graftals, for example. You might think, since I have equated formal grammars and computation, that I believe using a computer is equivalent to using formal grammars. Not so. We need to distinguish between using a medium with rules for its inner workings versus explicit artistic use of rules - e.g., graftals. When I use a computer paint program, I am no more restricted by the implicit computation rules employed by the computer program than an oil painter is restricted by the rules of chemical bonding of paint pigment implicitly used by the paintbrush and canvas. Now, I may elect to impose

some rules on my painting, but it is my explicit choice, not the computer's. The reason I object to your wording is that it implies that use of computers implies use of rules. This is a misconception of computers by artists. The only rules that are enforced are those put in place by some computer programmer. As such they can always be changed. In fact, I urge artists to force tool programmers to give them what they need. What exists is not what has to exist. A computer is a completely fluid medium. Just because a 3D program uses classic Renaissance perspective doesn't mean that all 3D programs must use it. No, it was just the obvious thing to program the first time out.

11. Are there artists/designers/architects whose work they regard as particularly "grammatical"?

I think of Vasarely, Mondrian, etc. as obvious users of "grammar",

but I think this domain is essentially unexplored artistically. Most usages of "grammar" with recent artists is simple-minded use of the idea: a few rules, applied only one or two derivations deep, with a simple set of symbols. The idea is so much grander than that. The computer is the tool that makes it fully available to artists now (control of complexity).

12. What distinguishes art from design? Do you agree with the statement: "Design is computation?" If so, how do you define art?

I believe the distinction between art and design is not distinct.

That is, it is a cultural distinction. Hence it can change with time, or as seen from a different culture. An artist, to me, is anyone who is exploring the edges of our culture and showing it to the rest of us. If I were to draw a distinction, I would say art is what an explorer does, whereas design is what the rest of us do with the stuff once it is well-known. I strongly disagree with the statement: "Design is computation" In fact, to say it indicates a lack of understanding of computation. Its intent seems to be to denigrate both design and computation: both are less somehow than "art". I believe I have argued my point above: The computer is another creative medium. It is infinitely fluid. It has no more control over the creative artist than a canvas has, unless he chooses to have it otherwise (that's where the fluidity comes in). Computation is the most elaborate human process we have ever defined (not to be confused with understood). We just invented it 60 years ago. We hardly yet know what it is. We need artists to explore its edges and tell us what it is. To think it is rigid, fixed, linear, incapable of change, anti-creative is not to know it. Some early programs could be accused of all these, but this is confusing poor use of the medium with the medium itself. Toy Story is the most complex, visually rich animation feature film ever made because some aspects of the process have finally been brought under

artistic control by the computer. The computer in no way constrained the animation talents (world's best) of the star animators of Toy Story. Rather it gave them freedoms they've never had before. They, the animators, tell the programmers at Pixar what the program should do, not vice versa. Computation is an amplifier of human capabilities, not a restrictor.

Alvy

Thankyou.

Paul Richens: Interview by Dean Bruton

Martin Centre, Cambridge, UK

30 July 1996

Paul Richens, Director of the Martin Centre developed and marketed the computer application, *Piranesi*.

Is the Piranesi project [a computer drawing program] a system that allows people to articulate changes in derivations and the rules?

Yes, in some senses they would come back to saying we have already done that by using the same model, same viewpoint and four different transformations of the image. It invites that kind of activity.

Would it record a sequence? or would it have various dated files?

Yes but it is not particularly sequential. It has sequential things as well, because basically it is a re-rendering program but you can feed the whole thing through twice or as many times as you want. [Discussing the cover of Piranesi package] So here for example that is a first stage and that is a second stage etc. That would take about ten minutes to produce that sort of effect. All these are re-renders of an initial drawing. So it can re-render again in many ways including effects, say like watercolour or whatever.

So there is a capturing of stages which might be discussed and refined.

Yes, It always is multi layered. You can talk about the painting struggle and the process of getting to a final solution. In computer graphics previously, that never happened. The final image was pristine and bore no traces of the struggle to produce it.

Then Piranesi is really like a painting program that has a three dimensional quality. Does it have an engineering dimensioning capacity, or is it mainly a visualising tool?

No, It could have to some extent but that would be so against it, its right brained outlook, we don't allow a single number on the user interface, not visible.

When will it be available commercially?

It has been developed commercially at the moment and plans are to release it soon. There is stuff on it on our Web pages. If you are interested in these issues it is a really good counter example. It explicitly avoids the metaphor of rule based grammatical design.

What was the background to this current activity?

I started of in natural science and switched to architecture, did a full

architecture course up to professional qualification, than I joined an early pioneering company of computers in architecture. I spent 20 odd years with that. We were about five years ahead of AutoCAD, it was GDS system. It is still around. It was too complicated to be suitable for architects. I have been here at the Martin Centre for the last six years and in some ways trying to go against things that I tried to do commercially. GDS was complicated and the struggle to learn it, to master it was enormous. So I have been looking at simplification in these kind s of systems. Piranesi is one of the results. This was taking rendering and trying to make it very simple and visually rich and attractive. It demonstrates this superbly. People just want to have a go when they see it. So it should walk off the shelves. We are trying to the same in other areas like solid modelling and in the virtual reality area. How to get something which is more of an architectural experience out of it than normally happens.

As for grammars I am interested in them but I have never found them of practical use so far, to be visually rich and attractive to use.

Would you explain the history of the Martin Centre and how grammars have played a part in this?

The Martin Centre is about 28 years old. Formed by Sir Lesley Martin, who was Professor at the time He was also an important architect, who'd worked for the GLC and he'd had an enormous scheme for the redevelopment of White Hall in London, which was the government quarter. And he teamed up with Lionel March, who was an architect and mathematician. They seemed to have very good symbiosis between the two of them. Lineal started developing a series of propositions about shape of buildings and the form of cities, which was informed by Lesley Martin's very considerable architectural experience. Between them they set up this centre as a research school. One of the first research institutions in architecture, I think, that was founded.

To look at things in a very sort of mathematical formal, it was sort of a bit like operations research perhaps. It was a fundamental motivations. On four different fronts, they were going to look at buildings, they were going to look at campuses. Things like say universities, was the actual scale they chose and that the area of cities. So there were three different scales. There was a city, the campus and the building. There was a study of offices, which looked at individual buildings, a study of universities, which looked at complexes of buildings and was a study of cities. And all trying to use a mathematical geometrical approach.

Now of those three, the study of cities was actually very successful and still goes on. Martin actually did that - invented a elaborate kind of economic, combined with physical model of cities, which interrelates the use of land, transportation systems, the kind of goods which was sort of up and down and people that moved on the trans-

portation systems, rents and all kinds of economic variables. And he can predict how cities grow, of the effect of a new freeway, those sorts of things really quite successfully, and that's still going on. So that did work. The universities study was feeling at the time of development was going on, a lot of university building and also other big complexes like hospitals were being built at the time. And rather failed in fact because of this kind of activity, because of changes of government and change of the economic climate.

It became rather heavily involved in things like time tabling. If you're going to design a university, how much space do you need, depends on how many students you have and what the timetable was and what kind of spaces they need and how much they could share, and that sort of thing. And it got rather remote from, I think from architectural considerations.

The "building" one, developed into a kind of geometry you find in Lionel March and Phil Steadman's book, which was written in that time on geometry in the environment. Grammars hadn't really quite arrived there. Phil Steadman got involved in a long and very complicated discussion about how to dissect a rectangle into five different pieces, which took him a huge amount of time. Eventually, they hired a mathematician who solved it, using a application in about a fortnight, which is interesting lesson in itself. And if you do these things, you should get the right sort of expertise engaged in it.

Grammars arrived later in the form of Bill Mitchell. It was he who started that off. Bill and George Stiny. George had been a colleague of Lionel's for some time and George and Bill Mitchell got going on the shape grammars with the Palladian example. That actually happened here. I am not sure. I believe the inception of it did happen in Cambridge, but it very quickly escaped to Chicago and UCLA and other places, so we're not really responsible for that development.

Did grammars still play a part in any of the work here?

We get students quite often interested in it. John Rollo being the most recent example, and we did our best to persuade him not to take it too seriously. It is now a historical subject. I don't think we convinced him. We got quite a bit back from John Rollo actually and he was very keen to talk about them and the circumstances and he found students were actually quite nice to him. But his grammars were different from ones we'd met before, because we had been brought up on the George Stiny and Bill Mitchell's, rather formal approach. In George's case, extremely formal, mathematically rigid kinds of grammars. And George always made a point about that kind of thing, being exact and precise. But John came along having been in Terry Knight's studio with the looser kind of grammar and that seemed to be a fairly comfortable situation.

There seems to be an extreme position—"the" Palladian gram-

mar as against a Palladian grammar.

Yes, that question was one of the things that worried me. The Palladian grammar failed for several reasons. One was that it seemed too arbitrary. So many others could have been written and why was this particular one being presented to us as being a particularly interesting Palladian grammar, especially when one was aware of other ones he could have written. It would be interesting if it had somehow explained Palladio's motivation or something to do with those buildings, which it didn't and it seemed almost totally devoid from anything you could conceive Palladio might have actually thought. So it seemed rather a failure. Later developments Ulrich Flemming's work for example, seemed less troublesome than that.

I am less interested in grammars as a means of representing the designs of others in the past, than in the relations between the concepts of grammars and the process of making designs, especially Donald Schön ideas of a reflective practitioner. Can you comment on the idea of whether a reflective practitioner and grammars and how you see the two relating?

As I was say just now. It's a little while since I read Donald Schön's work and my recollection of it, which might be slightly faulty, was that he was trying to make some distinction between the architectural discipline and lots of other ones that you might be taught in the university. I have a feeling that the grammatical approach to life is more the engineering one that he was trying to argue against.

Can you see reflection in practice as a useful metaphor or model for designers?

Oh, absolutely. I think what Schön said about how to practice as a designer is extremely responsible. I suppose its the nature of a reflection is what we are arguing about. What we're arguing about s the question of whether there a big difference between forward thinking and backwards thinking?

A forward thinker, somebody like a computer programmer, who has to think about the future in order to write down algorithms—is it going to work more or less reliably in a wide range of circumstances in the next five years or so. A huge amount of foresight is required, planning, looking ahead. There was the other kind of activity which is may be looking back at what you've just done and making some change to it, but without huge amount of forward thought. Now one is a left brain kind of activity and is planning writing programs, and the other is a right brain, immediate response, which is very appropriate in visual arts.

Architecture actually finds itself saddled in the middle, because architects have to behave responsible. So he has to think forward about all kinds of things. Possibly this thinking forward is difficult, because it lies at odds with how he has to work as compared to

somebody who's creative visually—with that kind of thing it is an inhibition.

Derivation sequence according to rules is known as a grammar.

Yes.

I am interested in the idea of a contingent sense of grammar, that is when rules appear to be used, when they change, when there seems to be a sudden change in derivation and how much rules appears to carry over from one work to another. Do you think that is a reasonable kind of proposition? Is that something that you might use within the Centre?

I think we have areas where we might be interested. This is very much the academic way of studying, say the works of a painter, or something like that, isn't it. To try and draw some—and find out what the consistent elements are—what the thread is and how it is developed. "He did this and then he did this with just the same thing but slightly different. Then he changed his mind about that and it went from blue to pink and that sort of thing." Its like how you spin words around a visual subject isn't it. It's a good way of doing it anyway.

How we might do it at the Martin Centre? Apart from the Piranesi project that we're talking of, which is trying to precisely to do the opposite and has been reasonably successful. I do see some possibilities—I am talking particularly about urban textures at the moment. If we look at an aerial photograph of the city, particularly an old one. You can see different areas, which have a different quality. Some have long straight streets, some have short and wiggley ones. Some have very consistent building heights and some being quite mixed up.

And there's actually a huge range of quite subtle textures to be seen in a city and it would please me to be able to understand these better by producing algorithms that perfectly generate and forge these textures the same as the Mandelbrot forged mountains and rivers using his fractals. And I think we did manage to get some understanding of these that way there would be some practical importance as well—the classification of textures which can be very useful all kinds of economic and disaster proof purposes.

So that would be one example. Generally, how do you see the place of grammars in making new designs?

In my field, we find that algorithms, which actually design things are very few and far between. I think these are probably analogous to what you are saying here. When can you actually write down some rules, which do something useful. And it turns out if you look at just ordinary CAD programs, they all have a little procedure, a macro or something, for doing staircases. And sometimes I have ones for putting in windows and walls and sealing off the ends. The stair-

case is the classic. For some reasons staircases can be designed by computers, for its pretty well nothing else in architecture can. And the reason is, that staircases were so completely codified in every known country and has very precise rules about how steep they are, but the rise to tread ratios and all that sort of thing. Which is tolerably difficult to satisfy as well, but its easy and almost useful to write a computer program which solves this little tiny problem. But, what's going on there, in fact. If you can write a program to design staircases, it means, but you're doing something not creative. What you're doing is a minor variation of something you've done before. There are a few parameters you can change like height, or width, or ... everything else follows as a consequence. That's only because centuries of experience with staircases, which is in codified and codes of practice, that we can actually write this program.

If you want to be creative—something creative is, something which you hadn't done before, then you can't write an algorithm, you're not in a position to do that, because you don't have the experience on which the thing is based. You can obviously be divide what architects do between routine, like you know doing escape stairs, which can be done by algorithm and the creative which can't.

How do you relate that question, like, the place of grammars in making new designs as a loose analogy and also its formal system? Do you think its helpful to generate new ideas in art, using a formal grammar of some kind?

I have difficulty with it generating "new ideas". Its obviously useful in carrying out established ones, in architecture. I mean ask me whether I would design with computer programs and I would do it with an architect, normally. Because in the Piranesi project, on the user interface side we would have set ourselves rules, like no numbers will appear in the user interface is one. Every action has immediate feedback, or the unit will undo is a single gesture with your mouse. These kinds of rules, you write them down and you say these are the principles on which we are going to do this, because it doesn't work when its boiled down and it gets modified. And exactly the same thing to an architecture all the time. An architecture will have an idea about how to deal with his floor to wall junction which he is going to use over and over again. Something which he's going to use over and over again. It's commonplace for people to formulate these rules, if you like to give a consistency to their design. Though, I'd hardly call that the creative part of it.

When is it useful to use a formal grammar?

Mathematics.

Just for mathematics?

Well, mathematics "is" formal grammars. Everything in mathematics can be understood as string rewriting rules which is what formal

grammars are.

Would you agree that design is computational?

May be we should go back to mathematics. You can't be creative in mathematics by doing mathematics. Mathematicians rely on moments of inspiration and they spend years afterwards trying to formulate it as a proof, which is the using the rewriting rules to get to the conclusion. I think there is a fair amount of literature on mathematical discovery. It indicates that there are two separate modes. The grammar isn't particularly useful in discovering new things.

If design is computation, what is art?

[laughs] Don't know.

Design has some distinctive qualities?

Well it does, yes. It speaks to you. It has a human being on the other end of it, doesn't it. Its like the pictures you were showing me of the pansies. The interesting thing that was not the grid of rules or what happens to it, it was the pansy. In fact that is what distinguishes it. If its a pansy in your computer and you have chosen a random icon in Macintosh then it probably ceases to be interesting.

Can you think of a work of design that you would say is a work of art as well? Can you list an example or two?

In graphic design Appolinaire's poems set out where the shape of the typography looks like the shape of the subject of the poem. In architecture, *Ronchamp Chapel* (Le Corbusier), and Bramante's *Tempietto of S Pietro* in Montorio, Rome (1502).

What are the qualities that make, lets say architecture a work of art? What are the qualities that concerned that might be computable that make the work of art, or are there qualities that are not computable that make the work of art?

There's an interesting area close to this, which might be as far as you can compute. There's something about "eye catchingness", which interests me and might be worth pursuing grammatically. What is it that makes something arrest you when you look at it, as opposed to just boring, and we know that a completely flat featureless surface is pretty boring and we know that a complete random set of pixels or whatever, where every dot is completely uncorrelated with the other, is also boring. And somewhere in between those two extremes, are total uniformity and total chaos. There are structures which aren't boring, and more interesting or at least arresting. I don't think any such thing generated by an algorithm could claim to be a work of art, because it doesn't communicate anything, because there's nobody there to communicate. But it can still be eye catching if you like. It would seem worthwhile and entirely possible to try to explore that what it is that makes something stop you, which is obviously something to do with having some structure to it. Not too

much, not too little. Not too regularly structured, you know.

The curious thing is that I discovered that Chaos theory is also getting interested in this. And going through a series of developments almost like Rudolf Arnheim. Yes, being trying to make the connection with information theory and art for centuries but not quite making it. I think that they are doing the same thing. Why do butterflies look like they do, and flowers and other animal signals. There obviously there to catch the eye of other things, whether it be protection or attraction. They have the same effect on human beings. We also are attractive by butterflies and the logical qualities that enact that kind of thing?

Are other systems beside grammar, such as I think the L system?

The L system is clearly a grammar. It's a string rewriting procedure, which in the end, in the original formulation drives the total graphics and paints pictures, but it's exactly analogous to Stiny type grammars, but it's motivation was originally to understand embryology. How does a single cell divide into two and then into four and so on, and gradually assume a form: What kind of rules are involved in that?

Do you think that would be more useful than a rule based grammar approach in art education?

I think it's tackling a problem, which is totally appropriate, isn't it: embryology. Once an embryo is fertilised and sets off on its development, its following rules, I think. That is if we believe in the powers of God is involved directly in forming what happens. To find out what these rules are is a major intellectual problem. Very, very interesting one. Whether such a rule can be then expressed as a grammar, I don't know, but it is certainly interesting to see.

Do you ever use computers as a medium for design. And what was your experience involving derivation and rules, and the idea of deriving innovative designs with computer.

By rules, I've not found that at all. We're talking a little bit about the Kai's power tools, texture generated kind of thing and I find that very frustrating. Where you have a patch of texture, which is the starting point and then around it, some parametric variations from it. You pick the one you like the look of and that becomes centre and then it produces nine more variations. The only control you actually have is how fast they deviate of a variance going to be close variance or wide. And the frustration of that is that you don't get to where you want. It leads you off into all sorts of random places, but if you have an idea in your head of what your trying to go through, its entirely frustrating. I must say, Simon Schofield, the guy who did the Piranesi, he was a painter. He did the software. Totally agreed. It isn't very often, it's unusual - that somebody wants to be inspired

this way. Like having random variations thrown around.

Are there artists designs or architects whose work you regard as particularly grammatical that you might list?

Apart from Lionel March. I am not sure but I thought about it. I haven't been collecting it.

Architecture?

The architectural example that springs immediately to mind are all didactic rather than practising and there is an important didactic component to these kinds of rules, grammars, theories of proportion and all the rest of it. They have mostly been invented by teachers in order to communicate. Like Serlio's which define the five orders, the columns, classical architecture. Theories of proportion that pretty well always written down for mnemonic purposes, to make it easy to memorise. This goes certainly for Vitruvius who was doing it that way and it goes on. That's why it existed. The only counter voice that I can recall, is Michelangelo. Somebody who said that the true artist keeps his callipers in his head when his eye doesn't need to know what the rules are, he can do it anyway.

These theories of proportion were guarded as of mystical importance weren't they, up until about the time of French revolution. Something after that Perret dismissed him as having absolutely no basis and psychological existence. They were merely convenient. By now they've become familiar so that is why people even liked it. So these rules, once they get written down academics feed off them don't they. The whole of the theory of architecture, which is the business of spinning words about it is about books on architecture, not about architecture. The books have all the rules.

Thankyou.

John Rollo: Interview by Dean Bruton

School of Architecture and Civil Engineering, University of Bath

26 July 1996

John Rollo is a lecturer in architecture and engineering at the University of Bath. He has specialised in shape grammars and their application to architecture and design.

My thesis is about its about the loose analogy of grammars and its about the language of formal systems that grammars can use so your work is relevant because it discusses ways of going from the practice through to helping people, through educational methodology to do with shape grammars. Could you talk about that and how you think that might be best tackled?

Yes, I think its more helping design students to realise what they want to do. I think that shape grammars is a marvellous vehicle or will be a marvellous vehicle to be able to do that.

How do you go about simplifying the idea of shape grammars, either as a loose analogy or formal system for students?

The thing is that only until recently has shape grammar sort of been moved from academia to the design studio itself and really it's something which needs to take place in the design studio. I see it is something which the lecturer takes in and runs through. It is very much a tactile hands-on thing.

Do you agree with the statement that "Design is computation"?

Yes and no. It depends on what you see design as being. There are those people who see design as being very structured and formal and computational and there are those who feel that it is totally not computational. They get inspiration from anywhere. I don't think it is as black and white as all that. I am fascinated by the computational aspects of design. For me, coming from a design background itself, a practical background is very much looking at something like a formal structure like shape grammar to help expand my own horizons. I have found that extremely valuable. I think that I can see that the other students who are coming through who would equally benefit by that.

Formal systems isn't something for everybody and I think the purpose in design education is that finding that key for each person. I think we all have the ability to design and I think that adopting different methods in a design school is the approach that we need to take. I would think that shape grammars is something which can figure prominently but not exclusively in a design situation or a design school.

So given that you think that design is computation, what is art?

I don't think that you can sort of define art. I think that as with ways of going about design there are multiple ways of interpretation in terms of art so, I don't think there is one definition that you can give to satisfy everybody.

Could you give us an example of a piece of design that you think is a work of art?

I guess asking me is probably the wrong thing to do because, a) I eat breathe and think design. I will quite often look at anything as saying this can be art. I guess it depends on what I see and my mood at the time. Edgar Lutyen's *Heathcote House* up in Yorkshire is a piece of art.

What are the qualities of that then that make it a work of art?

Definitely the way that the whole building itself both spatially, in decorative design and detail is a huge cohesion right through a whole range of scales right out to the garden in every aspect. It's totally embodied within it. There is a thread which links the massing of the house down to the tiling patterns and arrangements on the floor itself. The thing works together.

I am less interested in grammars as a means of representing the designs of others in the past than in the relation between the concept of grammars and the process of making designs especially in Schön's idea of the reflective practitioner. Can you comment on the idea of reflection within the making of grammars and its place and importance.

I think it is terribly important. I think you as a designer have constantly got to be in touch with what you are doing. If you are doing a generative grammar and you are using a series of rules, you will go through a series of generations at each stage, I think you reflect upon what you have done and what you are going to do. And I think that is an integral aspect of the design and what the design is making.

Do you think these need to be articulated or can it be an internal reflection that is never external?

No, I think that these can be articulated. It depends, —I think it is nice if it is articulated. I mean if it is articulated it is almost like a scientist's record book. You know, you take Leonardo De Vinci's sketch books of which there are stacks of them where he has recorded every step of a practice or an experiment. You take the geneticists these days and the biologists these days: their log book and their record book of what they do and which track they go down, forms a basis for the reflection and I see the whole process like an architect's sketchbook, the traditional sketchbook where you go round and you sketch precedents and things and bits of detailing and that as a record of your observations. I see the sort of rewrite procedure, the

little sketches and the icons as being a terrific system for encapsulating your ideas there too. And being a record it gives you a system whereby you can actually refer and reflect back to that decision that you have made and the design process.

Derivation sequence according to rules is known as a grammar, would you agree with that?

Yes, I think that is fair enough.

Can you give any examples of artists who appear to work with fairly strict rules?

Known or work seem to reflect rules?— You can say take the classics like Mondrian and stuff like that in their later work, A lot of the Dutch people who are working in art, very mathematically based art stuff. But in the 30s that were working then in the schools there. There are stacks, I am sure there are people who would be able to wheel these people out.

I am interested in a contingent sense of grammar. That is when rules appear to be used, when they change, when there seems to be a sudden change in a derivation, how much rules appear to carry over from one work to another. Do you agree with the idea of a contingent sense of grammar and that it adds something to the ideas of grammar and the usefulness of the body of knowledge about grammar.

When you talk contingency, can you elaborate?

Contingency means two ideas of contingency, one is that there is a sense in which there is something added to the practice or understanding of working through an understanding of grammar, and the other one is the contextual situational environment.

Okay, so you have got contingencies that you are working with.

Yes , that but also in a sense that a knowledge of grammar adds something to the way one works.

A knowledge of formal procedures in the way one works you are saying? I think that it is necessarily a knowledge of grammars themselves. I think grammars have an overriding way in which you approach something which you think about things. I think that one of the great things of grammars is that it requires or demands a discipline. It demands a discipline in the way you focus and think and so you if you are addressing an analysis of somebody's work, it's terribly important that you,—it's hard work it's really hard work. When you look at the work of an architect and you have got to look through you know the superficial thing there constantly to find out as many different ways that you can read and re-read the work they have done. You have got this whole problem of design fixedness and design fixation. I think one terribly important thing that we need to

be aware of as designers is that we are not meant to be looking at the world in one perspective in one particular viewpoint. We should be looking at the world through many different viewpoints. A normal person in the street will be looking at a thing from one viewpoint for a very long time until some outside factor will impinge or will interfere with that and it will distort their perspective and they will say "Oh, I hadn't seen it from that perspective before". I think the important things about us as designers is that we should be looking at things from a multiplicity of ranges. I think that one thing about grammars that when you are talking that you say you're doing a derivation of this design or trying to find some salient features about this design whether it's the way the artist has done it or not is irrelevant, it's actually looking to see if you can actually find something in there for you, well then yes that's terribly important. So I think yes, having an understanding or feeling of a formal procedure as a grammatical procedure is terribly important and also in the synthesis itself.

How do you see the place of grammars in making new designs as an analogy as a loose analogy and also as a formal system?

It depends what you are looking at. If you are looking at the one-off design of a custom-designed house for a sole client or you are looking at the mass productions of carpet designs or what? It depends on the scenario, in either situation I think it is applicable. If you are wanting to produce a product I don't know whether it's a teaspoon or something like that something maybe it's a decorative feature. I think it's very useful. It's very useful because you have in this situation of generating a whole world of ideas and designs from one simple theme within that product. In terms of a very much tailor-made situation I think its equally very important too. If you're into sort of house design or residential design for single clients I think that it's crazy to go back to square one start off and re-invent the wheel again. You obviously build on a body of knowledge which you already have and you innately select what you like. What you don't like and therefore adopting a formal structure there where maybe you to focus very carefully on what you are doing and to be able to build on this knowledge which you have in finding different permutations.

So, when is it useful to use formal grammars for example?

Anytime. I mean over the last few years because we have sort have been in America and Cambridge and everything like that a lot of my work has actually been on the analysis side of it. But because I really can't go for a couple of months without sort of doing something on the synthesis process, whatever it is, whether it is designing posters or whether it is designing an exhibition or whatever I will adopt it straight away.

I will develop a series of parameters. Whether it is a series of shapes

I am working at if it is an exhibition; whether it is a certain panel that I am working with and how I am going to actually work with that panel, then how I am going to combine these panels, I adapt it straight away. It's use to me now is—if I am confronted with just a blank wall or whatever, and somebody says "Go away and design",—and you might previously have thought, "What am I going to do now?!"

The thing is, it gets you into a discipline, it gets you into actually developing a program for yourself, for developing a construct and then from that you can actually develop a design very quickly. You then have something to work with very quickly. With the rules and running through the rules and everything,—a lot of it has to do with geometry and the placement of form. The whole thing then starts to sing and you really start getting through one or two very simple and basic ideas and a wonderful coherent structure. It's fun it really is and it's something which can be quick.

What you actually start to find is that it is not a laboured process but you then start to form your own tuition very quickly so you then start to develop a very acute process of vision and recognition of knowing what if you transform something what that is going to give you and what it's not going to give you.

The basis of training and building up this knowledge probably starts to get you onto a par like somebody like a Frank Lloyd Wright or like an Edwin Lutyens, where you take these people who are extremely prolific in their work. You had so much in their practice that they couldn't stop and say, "Oh well, what am I going to do now guys?" The thing is they wouldn't have to come up with an idea like that. They would have it sketched out on paper and rather than just churning out the same old thing themselves, they would be able to manipulate things very quickly so that they could see what they were doing. So you are continually building on your experience with this.

Do you ever use computers as a medium for design and if so what was your experience involving derivation and rules?

Is this in a programming situation or is it just using sort of like an off the shelf program like just a drafting program or what?

In the two senses of innovation and creating new designs whether it is a loose analogy and as a formal system , what was the experience?

I have never used computers for a formal system in the sense that writing in terms of programs or whatever like that, computer programs I am totally illiterate in it. I mean, no I haven't gone and spent two years trying to learn a programming language because of being so many other in shape grammars which I think are far more important to work in than to say going off into that. Using it as a tool as

purely as a tool as a drafting machine or a series of a palette of colours, yes I have.

I find I do all my drawing now for my work on the computer. I don't use a drafting board anymore. It's crisp, it's clean. Once you get over that thing where you are actually not using the board and the parallel lines and the pens and worrying about your greasy hands and the whole thing, it's terrific. It's fun but it takes a little while to actually jump that threshold.

I couldn't sort of see myself not using it but as a formal system I haven't utilised it as a formal system. From people whom I have spoken with and some of my students which I have had in the past who have actually gone and written a shape grammar for me it's much quicker to actually get the bits and pieces at this stage and to actually manipulate them with my hands rather than spending hours trying to write in very simple transformations and trying to do a design.

Computers are not at that stage at the moment with their programming language and things that you can sort of do something very quickly and run off, it's a very long tedious process to do that. That's my understanding of it.

Why do you think that grammars have taken 25-30 years to get to the point of being accepted by the architectural and design profession?

I don't look at it as being 25-30 years. If you say 25-30 years for the inception of an idea it's a very short time, extremely short time. If you are saying on day 1, a guy thinks of an idea. If you think from that point where has taken that idea to where it's actually put into a design school actually adopted not just in research practice but in the studio, and then you get a body of students who have come through don't forget that it's five or six years for a design program then there is another two years after that for someone to actually go through and get sort of registered as a practitioner so you have got ten years there.

Thankyou.

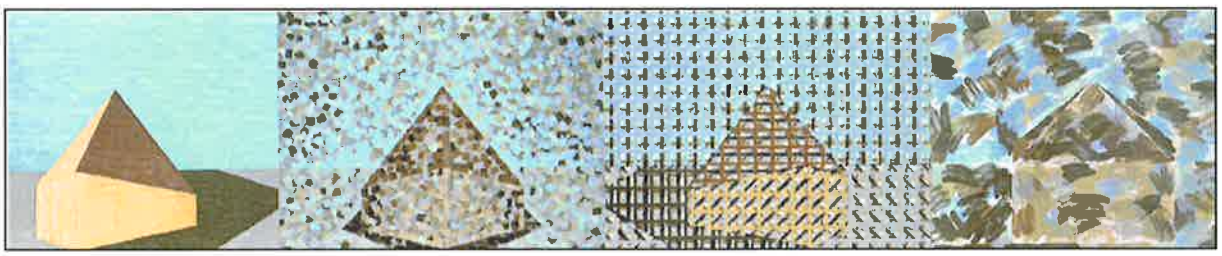
Sid Sachs: Interview by Dean Bruton

Lock Gallery, Philadelphia

21 July 1996

Sid Sachs, Curator of the Lock Gallery, Philadelphia.

Jennifer Bartlett's images went around every wall of the gallery, and it starts here [Looking at catalogue of an exhibition]



Jennifer Bartlett. 1978-79.
Graceland Mansions.
Oil on canvas.

Okay. Bartlett's exhibit start out with simplistic certain colours, a house, a tree, a mountain, a cloud. And then it goes through all different variations on how to build, line and solidity and variations on is this a mountain? Density, size, scale, repeating, becoming pattern, is that a mountain, is that a mountain, like how we define things, the house, the colours, every variation and builds up on the vocabulary. So these are all one, two, three, four, five, six, seven by seven foot walls. This is going around each one of the walls and this is very similar to some of LeWitt's wall drawings but it's only one section and its derived from this simple code.

So it's like taking the systemic work of LeWitt and then bringing back images, in fact she was in the new image show at the Whitney.

What year was this done?

It was when I was in graduate school so it's in the early seventies, probably early '74. A house now large and many plates and then a tree, is that a tree or is this a tree, ways of putting marks onto the plates. There's a tree to. Is this how you depict a tree, or is this how you depict a tree or is this how you depict a tree?

Her work now is completely different?

I can show you examples. Yes, the newest work is, there is still a lattice of grids, but much more involved in narrative, I think this is a form narrative maybe like going through every primary stages as rigorously as possible and I don't even understand all the....it was so large that it was hard to comprehend.

I think this is just repeating the information but these are details, there's a mountain, now this is Leipzig, this is the scale. The grid was done beforehand. These are all baked enamel silkscreens so it's a combination between that which is binary and that which isn't.

How many years did it take to do all this?

I think two years.

[looking at pictures of Bartlett's work]

There's a house and I see individually they don't seem to have any system but overall it definitely does.

Shape grammarians have got this kind of stereo-type that they have to put up with that it's going to be very black and white linear so versions of the world this is a much richer way of thinking about it.

Speaking of black and white look at these variations.

She did another series very recently, last year. It took the theme of twenty four hours.

Using the same elements as in this work?

One for each hour of the day. Each one is broken up into sixty sections which are the minutes and one section is broken up into sixty sections which are the seconds and then somewhere embedded is a clock that tells the time and the imagery is somehow related metaphorically and metaphysically or literally to something that she assumes will be happening at that time of the day or night. So if you had insomnia and you were up at two o'clock in the morning you might be smoking in the garden and that's the seconds and that's hard to see and there's all that lattice and the clock, three o'clock in the morning, four o'clock like a ghost and you can see the griddle, five, up and dancing, waking up and having a shower, getting your breakfast ready, starting your work in the studio but you can see the lattice and the grid and the imagery even though it's different it's still, she sets up a system that she's consistent with in this body of work.

Yes it's strange when you start thinking about systems and grammars and the rules you start to see the negative effect to a certain extent.

She always have this lattice with sixty, there's sixty big ones, and sixty small ones and then she always has the clock and the image that comes from that period.

The grids for some of the pieces remind me of some work that Lionel March published—a paper on grids that are certainly similar.

[Looking at original paintings of Carl Fochin]

So this is Carl Fochin and his work has been a breakdown of an Albrecht Durer's resurrection print. Can we see some of Tome Chimes' work?

[Looking at the paintings of Tom Chimes]

There's a hat and a nose, a mouth and a chin—it's a portrait of Tom

Chimes but it's based on a photograph by Alfred Jarrey on a bicycle in a courtyard and all these other marks are different configurations that plot out Fibonachi spirals within the composition and golden beams and rectangles and sometimes there are also there are little letters here in Greek and I don't know this but if you configure at the right spiral and you read them in a sequence you will have a Greek word which may relate to the title or what Tom was trying to get out in the painting. But it also, if you look here it's not just contained within a circular image but they keep on spiralling out and all these shapes here are basically built up paint it's a relief in paint. And earlier works of Tom's were in metal and cut-out metal and things like that then he went from those to portraiture and I can show you some of those but this is typical of his later work which is, here's another mark here which looks like just a mark and one there, it's really hard to see the paintings and even more difficult to photograph.

He has people make these. This is cast from a paper model, I don't know whether you can see the Scotch tape? They are very simple shapes, but he keeps on building them and building them and building them. There is one at the University of Pennsylvania on the campus that looks like a Tony Smith but they become much more complex and I think that only the Parkinson's disease has stopped him from making a bigger career but they are very systemic and he makes every shape possible in building up from volumes from the Mondrotti?

This is a Mandrotti.

In at Tom's studio when I was interviewing one time and this is a drawing that he made with Indian ink on corrugated paper it's kind of hard to see, corrugations and there's a head here similar to the one that I showed you but this head which also is a hat is based on a Greek vase of Hermes. Hermes gave fire and was the messenger of the gods. But Hermes is really a two faceted character, Hermes is the troll of Faust so Faust's troll is Ubu in Jarry's plays. So everything is based on Alfred Jarry in Tom's work. So this is the easy to see, you can see the numbers, he actually numbers the lengths of these lines and these curves and sometimes on the paintings these points will be where the Greek letters on and sometimes not depending on the painting.

Like this particular one which you won't see, this is Indian Ink higher up but there is also a line here which probably you can't see with the camera and a line here which is words and it just keep layering underneath.

These screws, or knobs or images are probably, knowing Tom, placed in the same places that later points of ink would be, and they are almost like machines, made in metal. This is the last one that he did like that. This is Marcel Duchamp and it's based on a photograph that was in *Life* Magazine of Duchamp descending a staircase and

the Duchamp collections but then he started making these wooden frames. This is on a piece of wood and then from those, interesting is this metal relief he made these portraits

{Looking at a series of cedar framed portraits]

He made about 75 portraits of 19the and 20the Century philosophers, scientists, poets, artists and made these fakes? Frames as part of the panels and then from these, that's Robert Louis Stevenson, and then from these they became landscapes and panels of just centring image.

That's a picture of Jarry there in the light and you can see wood grain through it. This is where Jarry was from, France. The image which is almost like snap-shot size, is less important than the grain of the wood with the frame in this particular case. The object actually ends here and the artist made that frame.

[Looking at a series of almost transparent portraits]

Then he started making these later portraits which are very pale and ethereal and actually this is some people have taken these to ? thought that we had rectors but they are not and they are based on old photographs and if you look at the lips they are slightly tinted and this early period he used a little bit of colour and almost like hellos around the images and then later on he just used black and white, just reduced it to black and white and those relief paintings are like the ones I showed you yesterday.

And that's a picture of Jarry slight circle around the sun,—that's Jarry and that is the head that you see in the relief picture upstairs you see that it's the profile and this is from it it's a starting point. Sometimes he uses the contour lines in the back. There is one of Jarry's writings where there is an ape in the back and it becomes an ape's muzzle. Or he will use Tom's hat, Tom's will use his own hat instead of Jarry's hat in the photograph. So there are little subtle variations, and not completely photo realistic obviously. Like that hat is different from that hat, by cropping and there's words creeping up here, so you have two systems, you have the images of Jarry and the mathematical systems.

Does he wear glasses?! These marks are very small.

Yes, he wears glasses. But probably these are, even though they are in Greek they probably spell out something that Jarry had written, and there's a little Greek in here to. This one's concerning the dimension, but down here there is actually a head of Hermes from the Greek days, and there is a circle here and a circle inscribed within and another like a Fibbonachi spiral which you can just sort of see the top of the curve maybe. Spirals in here. For each of these points it is not random but built on a geometry.

Thankyou.

Thomas Seebohm: Interview by Dean Bruton

School of Architecture, University of Waterloo

8 July 1996

Thomas Seebohm is Professor of Architecture at the University of Waterloo. His recent work develops contextual grammatical systems for architectural design. He has published articles on shape grammars in the journal *Arcadia* and is a specialist in CAAD.

When did you first start up at Waterloo University?

I came here in 1985 to start up programming in architectural computing.

Could you agree with the idea that "Design is computation"?

I don't think I could agree that design is computation. I don't think we can look at our mind as a computer. I think it's a fundamentally different kind of device from the kind of digital computer we have is a sequential operating system. It doesn't mean, however, I am not a strong supporter of computing. I see the strength of computing as an interaction between the human and the machine and together they do something that neither can do individually.

And so as I was explaining to you before, when Karpov played Big Blue in a game of chess, the two very closely matched, but it doesn't mean that Big Blue is approaching the mental capacities of a human being. Big Blue does it with its own strength, which are huge amount of very precise memory and a huge amount of computational power—a kind of group force. Whereas the human being can remember a tiny fraction of the amount that Big Blue, but with its parallel system in computing and in its associations, it is much more powerful in it own way.

So I think the two are fundamentally different. I see works of art as being very complex having many simultaneously inherently many conflicting relationships that are resolved in the work part and the pleasure comes from seeing these relations and in that kind of resolution and be able in a work of art, every time you come to it, see some new relationships. That to me is true art and at this moment I don't - and perhaps never would computers on their own, conceive in that way. I think it's in the interaction between the two that we have the exciting possibility of seeing art in new ways, at new levels. And I see shape grammars as a higher level of looking at something, but it's not the totality of art.

Derivation sequence according to rules is known as a grammar—agreed?

Yes.

What do you understand as a rule and how would you explain the idea of a rule in visual grammars?

By visual grammars, you mean?

Design grammars, shape grammars, art grammars etc

Of course they are basically - at one level they are what an artist would do, as opposed to things he wouldn't do and in what order - what relationships in shape grammars is one form of rule, which precisely stated is: given a shape on the left hand side—one or more shapes these exist in the current design and the rules say that once those exist, some new shapes can be inserted, which either add to, or subtract, or modify the existing shapes. That means strictly what a shape grammar is, but there are many ways to frame rules. I think shape grammars is just one of them and when you talk about - say an architect Palladio, there are things he would do and would not do and you can call them rules. He would not, for example, have more than one very large room in a Palladian villa and a very large room does not span the entire width of the villa and then there's a relationship in the sizes of the rooms—adjacent rooms—have a gradation in size, but not too great either. And you wouldn't for example, have a big room and a serious of small little ones all around - much smaller in size, so when you study Palladio, after a while you begin to see all kinds of rules (if you want to call them that), that are operating, will allow you to see what he would do as opposed to someone else, perhaps like the English Palladians in the eighteen century. If you know all those rules—you instantly distinguish Palladio from some follower a couple of centuries later.

Can you give me some examples of artists who appear to work with fairly strict rules?

Mondrian, for example, that would be a classic example. Just coloured rectangles, or *Boogie Woogie* series with coloured lines. And of course, we know in De StiJL art - the artist tried to minimise the personal expression, the personal relationship with the work and to express in ways that within this framework that in some level depersonalises the work by insisting on a geometric framework underneath,—leaving then only the colour and area relationships and of course, the relationships between rectangles, but its strictly forcing oneself into the same kind of vocabulary.

That kind of art, I guess, at a certain level is grammar based on geometry that is lying underneath, that's not of course the total totality. Diebenkorn is one of my favourite painters also and while you might be able to say something about the underlying geometry—about the lines and the kinds of angles in respect to each other. That certainly alone would not define the work of art.

The areas of colour in relationships to each other. The over-bleeding

under of colours—the erasers, the unevenness in the transparency of certain colours. Some colours even evoke images to theme. At one level you can just say is a field of colour. So there is in those works, much more than the geometry, so when we speak of the grammar, it's only part of it and I think it would be very hard to come up, actually even the geometry itself, to come up with the actual proportions and space and the lines without looking at the colours and the lines and the colours and the fields and so on. And perhaps even knowing something of the California landscape - the colours and so on.

As you know I am interested in a contingent sense of grammar, that is when rules appear to be used when they change, when there seems to be a sudden change derivation—and how much rules appear to carry over from one work to another. Can you talk about your understanding of what might be a contingent sense of grammar and idea of rules changing within an artist's work that you are aware of?

I can talk only of the work on Chernikov, the *101 Architectural Fantasies* . I was specifically asking the students to make models of the perspectives and then I was hoping to learn something about the underlying grammar that we call Constructivism - it seemed to be consistent language. But then when we looked at it more closely, it turned out there was not, even in a single work, a consistent language where you could think of a set of rules that would generate the shapes. I could see for example, trusses - there could be a language for trusses. There could be a language, for example, for curtain rods, spacing and mullions and so on. There could be a language for the overall box forms in some of the models, but other models had cylinders and others like that one on the wall, for example here, it's neither cylinders or boxes, but it's a totally different language, these green forms. [shows a picture of a combination of forms in a Chernikov Fantasy]

But these forms and also the lower forms - each of them has their own language and you must see in some of Chernikov's work, that these grammars are repeated in other works.

So actually, if you were to think of those designs as grammar based, the designer would have an arsenal of grammar languages to work with and your contingency might have to do with the fact that under certain conditions, you would switch the language.

So that's what I would understand as contingency. And to me, where grammars might be used in the future is as a means of conversing with computers to quickly assemble related forms in some coherent fashion - some architectural language, without having to model individual basic forms.

How do you see the place of grammars in making new designs?

The question is do the grammars come first?. Do you invent your grammars and then does that inspire you to come up with new forms? Or do you have to go the other way—experiment first with some forms by whatever means are at you disposal, sketching or modelling on the computer and then sit back and say, "Ah, I think the language that I am developing, the grammar is such and such". And then you write it down and then perhaps you program it on your computer and you see whether this grammar actually constitutes what you're thinking about and then if it is, then you have something that you can use over again - something you can tweak and change.

Earlier, I was talking to John Schneer my colleague in the studio about why you're here and the common interest is in shape grammars and I explained to him what they're about.

He said "Oh yes, So that if we develop certain language in our office, we can put it into shape grammar and we can reuse it and that sort of thing". I said, "Well that's exactly it", that's what I am working on with my expert system, which is developing architectural details, so that for each building project that comes along, we don't have to reinvent these details. Or even if we have the principles, remodel them, because the expert system, unlike the normal CAD systems where you have a 3D model, which you then have to change. In this one the model is a set of relationships and you can put in different overall constraints regarding the shape. You might choose different building materials and it would put it together for you. You might spend some time in modelling individual bricks until they are adjacent to each other.

And then you can take the detail and have it assembled in sequences as an animation and a builder can then see that this piece comes first and then this one next and this is where the vapour barrier comes and this is how its folded and in a much clearer way that the two dimensional drawings you can explain what the buildings about. and without however, investing the time that it normally takes to make three dimensional models.

I was referring earlier to the primitive shapes, cylinders, spheres and so on. We were talking about Platonic shapes and basically that what's you work with in a normal 3D modeller and so what I see is that a modeller that can respond to a shape grammar you would put into it a shape grammar and then you would really speak to it and in sentence of a grammar.

John Schneer saw it as a device for formalising his practices.

Certain design practices in his office. But practices in his case at a formal level.

Is that a common view of architects, they think its a formalisation process rather than a generative new design innovative

process.

I talked to him only briefly before about shape grammars so this is his perception of the useful of shape grammars.

Generally, do architects subscribe to that view?

I don't think that people think of generating. In fact, I would be surprised if there wouldn't be a lot of negative reaction, because as soon as you get into the issue of computers generating designs, I think a lot of people would get very nervous.

How can people understand it as an innovative tool?

Yes, I think what really has to get across is our sense of contingency because, what people are afraid of, is that you're imposing some very regimented system of formal aesthetics which doesn't allow room for a program to be absorbed into it.

And Eisenman for example, is one example where a fractal like geometry is imposed and then hopefully a program can fit into, but if there's not an easy relationship - a give and take between the grammar and what has been contained within the forms generated by the grammar.

Another example - Santiago De Latrava is very strongly grammar based when you think of it, but in a sense he comes up with a new grammar for each situation. He's not trying to fit a situation into preconceived grammar. For example a bridge of his would like quite different from the Galleria in Toronto for example, in BCE Place.

or as opposed to World Exhibition in Barcelona, where he did design a bridge, I think it was, or the railway station at the Paris airport. In each case, he's got a consistent language that, because it's a structural language primarily, it lends itself very well to being expressed in grammar, but I think each case is a new grammar, so he doesn't have an arsenal of grammars, but he developed develops a new one for each situation.

When is it useful to use formal grammars?

Formal grammars work fast in very highly geometric, somewhat repetitive patterns. Classical architecture would lend itself to it, as in Bill Mitchell's top-down program. I think a lot of ornamental work as a student of mine has done on Celtic ornament, probably Persian carpets would go very well. There are a number of visual elements in geometries that are laid out - in a very well described in fashion. And then certain architecture as we have seen Palladio and Frank Lloyd Wright up to a point, there is - the work is consistent within the language that can be described that would shape grammars. And I see a potential for more routine architecture. Let's say in suburban houses, for example. Not unlike the Queen Ann houses that probably Michael Graves students have worked on. That you would come up with the grammar for a suburban area. As a designer, though, what

you would take, you wouldn't just randomly take designs. I think the key is being able to instruct your grammar system to select from all the possibilities. Something that's suitable to a particular, a particular client and site.

There's a possibility then - having here a machine man-machine interaction where a machine, could help you come up with a design that suites particular conditions, yet evokes something of other houses in the area that you have, an overall character.

Just as you might for example, near San Francisco have Bay region architecture. You know, it's not something very precise that you can define . And within that Bay area architecture, there are different types too, there are boxy houses and there are shingle houses and even particular architects that specialise in different kinds, but within each, you could probably have a computer develop designs in a particular language. The key is to realise though, that the computer cannot on its own, do it, because it would give you just millions of alternatives. The key is for those alternatives to help use the computer to help you focus in on a particular one.

Without having to redesign all the details and all the connections. And in fact that's what Frank Lloyd Wright did when he designed Usonian houses, he had some standard details that always worked, even though the individual designs would be quite different.

For example, he had sandwich walls, just three sheets of plywood with a core in between and then sort of tongue and groove siding, very thin walls. And there's a section right through the roof, which was made of 2 x 4s at different levels to the ground with the slab on a grade with integrated heating coils. That was part of the standard detailing. So he developed a language, then he could do variations - different designs. He didn't have to reinvent all the details. So that's what I mean. I think if you come up with a grammar including to details it would be useful.

For an artist?

For an artist, I think if you want to depersonalise it in a way that the De Stijl artists did, perhaps, but to give it a certain consistency from work to work—to explore certain themes without having to.

I think you can do different kinds of art with the same formal geometry. To me, I don't think the form of geometry is that important. Just choose one and then be consistent with it and explore it. And may be in that sense shape grammars are useful, that you would use a consistent geometry within which you can do your exploration. So that reinventing the geometry for each painting, does not become the major issue.

So Victor Vasarely or something like that generates his own colour systems and basically, he did everything with a piece of card, you know circles and triangles and squares and did every-

thing by hand. He could have generated a lot his work probably with a grammar much more easily, even though he did pretty well without it?

I guess what I am saying is the grammar might set up some rudiments of the work, which aren't the real essence of the work, but have to be done in any case. You need a geometric structure underlying most abstract art. Some abstract art if it's going to be geometric in flavour.

To take that a little further say then if Diebenkorn had used the Kirsch grammar, it would have short cut a lot of his thinking time.

Yes, perhaps he wouldn't had to spend time drawing, he would just say, "Okay, computer, give me an alternative here", and you know adjust the spacing between these lines in such a way and he would lay out three or four and say, "Okay, well I think is sort of what I want to do today, but then we'll just move this a little bit more". But he could go through all this without having to paint. Because who knows, I am not sure how he constructed his geometries before he started. He probably did some things—he erased them. Or maybe he didn't put the geometry first. May be he just started a line and then he'd give some colour patches.

One thing that I am aware of in Diebenkorn's work is that there's a lot of erasing and back and forth. One tends to think there's the geometry coming first, but now that I am talking, I am not sure whether he did. If he did do it first, I could see a shape grammar you know, giving him a geometry and then you start painting, and then that would reduce the labour, the boring part of the work may be.

Do you ever use computers as a medium for design. If so, what was the experience as a medium involving derivation and rules?

I personally have not designed in that way with rules, but being a full time teacher, in teaching computing, my own private practice is not that active and so it has to do more with my students and that is only now beginning that we have desktop computers, which are powerful enough to do something useful in studio. So there's the urban design studio where I can mention to you that I think urban design in our lives can be expressed in grammars and I think there is something useful there. If you were to explore the alternatives represented in the grammar by letting the computer and automatically or manually model some alternatives.

If I were in architectural practice, I could definitely see having a detailed system based on grammars and that's why I am developing an expert system that would allow you to store the philosophy of your detailing and come up with designs that suit particular individual elements

Do you know of others that have used grammars and could you

describe their experience with derivational rules within an architectural practice or, as an artist.

No, I am afraid I can think only of architects who I think, Lloyd Wright or Palladio who seem to be operating that way, but I think almost anyone who has a consistent body of work ,like van Doesburg or De Stijl architects or Frank Stella .

Well, even if we're talking about Rothko, the very simple grammar, much more subtly in the relationships of colours, the bleedings of the colours, the texture of the colours, its vibrations. So I suppose Rothko wouldn't really need a grammar. The grammar is so basic in the geometric part. The other part I don't think you could describe such complexity. It is so complex. As I say, I think grammars are more suitable for very geometric things. For example Matisse—I couldn't think of a grammar for Matisse. Because I think each work is quite different geometrically. I'd have to see the works of Matisse side by side to see whether you can systematically explore certain colour relationships.

How about Cézanne?

I can see that underneath he is very formal in the laying out parts of the painting. I can clearly see the golden section in many ways. Maybe one can describe the way you put colour patches down. We have computer programs now that would give you Van Gogh or I am not sure if Cézanne is among the choices, I think Seurat is available.

The point is that there is a consistency of applying colouring patches in Cézanne which possibly could be encoded. So that leaves some parts. I think the American painters Sargent seen some of its paintings that he can so carefully constructed the perspectives. Very careful, precise geometry underlying his work. So that there are constructive grammars for laying out paintings, there are grammars, for just how you apply paint. But never for the whole thing. Certain parts you can get assistance from grammars.

Finally, what can you gain as an artist by working with a grammar. Is there some kind of understanding that you might achieve through a deeper mathematical approach, or even a loose analogy type of understanding of grammars. Is there some awareness of insight, that grammars might give you?

Yes, well very definitely,—I've tried it with my students when we were doing Constructivism and we were doing Takumi Ida's works and even Mario Botta. There is a consistency of geometric forms and relationships in these works. And to me, a good work always has consistency running through it at some level and of course, a shape grammar embodies that. The problem is that it, as I say a shape grammars only suitable for very geometric aspects of the work.

If there's a consistency in it, say, of movements, or light, or its related

to the various rooms in the house, or the different parts of painting that would be hard to embody in a grammar, but the idea of consistency, I think can be captured by grammars and can be used to perhaps to explain how to proceed in painting.

How do you then go back to this idea of reflective practice and Schön's concept of I suppose using an hermeneutical l circle?

For some parts, I still see it more as a tool for laying out geometric constructions and underlying work and whether that's organic, or whether it's constructive as to a deconstructivist. I think some of the major moves are of a geometry that can be incorporated, but I think it needs other theoretical tools to support design work and art work.

So would you say that then grammars are limited for artist' use?

The problem is the complexity, say, a work of art has so many relationships and I imagine if you developed a grammar, that if you could equally incorporate these then it would grow exponentially in size.

One point the shape grammarians make, is they feel they have a better overview of what the art or design is about by looking at the grammars, but it may just be, that once the grammars get very complex, it in fact becomes harder to have an overview of what you're attempting to achieve. I think a musician looking at the notes can get a very good idea of what the music is about. There seems to be one to one relationship, but in a work of art, if you try to lay down on rules and relationships that actually embody, it might just go out of manageable proportions.

I only say this because the shape grammar examples that I've seen so far, always seen to end at a very simplistic level and don't capture the essence of the works. Whether it's Palladian floor plans, which is only part of it, or whether it's Frank Lloyd Wright floor plans and they don't include interior partitions or fireplaces and once you include those, the exterior forms don't work with interior. So it's back and forth in relationships. I don't see very embodied shape grammars, because basically there a sequential operation.

The relationship between Chomsky's work in natural language and taking that as analogy and applying it to visual language. Languages of design. Do you think it maps on comfortably or would you have some reservations about that?

No, I don't think it maps comfortably, I think there's a wishful thinking that the language analogies that art historians and critics wrote about in the nineteenth centuries can be made more literal. I don't know the work of Chomsky in detail and that I would wonder even whether you could generate a sentence in the sense of making up a poem, for example, in a generative way.

You could probably generate sentences, but I don't think would be

meaningful, or even works of art. I think the same problem might exist in language generation. I would think of the same problem also—in music. I know, and where a textbook which has LISP programs producing music in the style of various composers, but again those are just pieces. How do you get a complete work of art where every bar relates to all the others. What's coming before and what's coming after as one realistic work. Just to get something that sounds a Hayden or Mozart, that looks a little bit like Diebenkorn is not the same thing as a work of art.

I could give you a colour sample example, in fact I know an artist in Berkeley that uses Diebenkorn's paintings as colour systems for their architectural works. So the piece is not whole, you know, but it might be useful!

How popular is the school of architecture at Waterloo University, Canada?

We actually have a many applicants to the schools, which in good years could be up to 1200 or 1300.

Would you describe your selection process for the School?

Applicants attend an interview where they talk about their portfolio or answer any sorts of questions and whoever comes highest on their precis and interview gets into the class. You get some people who could think and express themselves in the spoken word and can conduct work that while it may not be as professional as someone who has many years behind them, their art does show some potential and so we begin already with somebody who in our eyes seems to be suitable.

Do you look for any special qualities?

A knowledge of grammars themselves would further an interdisciplinary type of education, also a knowledge of how the computer can assist in designing is another thing we are debating right now .

With our first year course, we've done two things. There is the course that's described in the handout. Then we thought, what we should do since we've called it a program, we should give the computing course in the context of what they might be expected to do in an office where they use a computer. They might be expected to know about colours, what levels of detail, etc, so it was a bit of working drawings, a bit of presentation, we even had some non-graphical tools, spreadsheets etc. In a studio they should be able to use and to do the sorts of things you see on the wall. [Form Z , CAD designs] We experimented linking that first year course with a interior lighting and so on and also drawing classes. Just to present something with the computer is a basic skill that's needed. I would put in structuring, graphic information in 3 dimensional models, also for 2 dimensional work , let's say in Pagemaker, then of course the other is generative approaches that can simplify the task of making more two

dimensional or three dimensional designs. Basic issues of data structuring, presentation etc. They need to do that with forms that with Form Z, for example you would figure out some macros that could be used to create something.

Does your School interact with industry in the area?

In engineering a program began with some education officers, these are staff people who find companies that are interested in hiring students, for example our people sent out brochures. [shows brochure] This is for architectural firms, they periodically produce one of these brochures which they send out, it has interviews with students, Andrew Smith, and so on.

They use computers to develop software that firms use so its useful information so I am sure that it's a combination of things, phone calls out of the blue, or phone calls following up, and how previous hiring worked.

We have also computing systems, that I would hire for example computer science students, I'll phone up the co-operation services and say I need a fourth year computer science student for such and such a term, then the next thing I know I'll get something sent to me. I'll get maybe four or five students and I get their academic curriculum vitae. It is organised, works very well and these co-op people are constantly making new contacts with firms.

We even have some creative arrangements for example I've just found out from my Director for example we even have one student with Renzo Piano in Genoa what they have done is, I don't know how to tell you this but Renzo Piano makes a donation to the School of Architecture and then the student in Italy gets a kind of grant from the School. So there is no direct link but it is a kind of money laundering scheme! [laughs]

There is active participation and follow up by officers of the School. Two of them are architects and they look after our students there and of course there are other people who deal with other disciplines.

By the time a student gets to the end of their course, their hypothetical course, what would be the qualities of the graduate that you would expect?

Well, I think that you should be able to throw them into any design problem. Perhaps one shouldn't teach by showing students examples because you just get very poor results.

Questions was concerning entry, conditions for schools of design and architecture, and whether a portfolio is sufficient and the outcomes of having a precis system and insisting upon literary skills for students in first year and could you comment on that?

Yes, well the School at Waterloo has always maintained that for stu-

dents to be able to succeed in our cultural history program a certain competency and literacy is required and that is why we've had an English test consisting of a precis where they have to read a page or two of printed text and convert it down to a single paragraph into a single sentence and one of the feelings that we have based on the correlations that were made not rigorously but have been made is that the good marks in English do correlate well with success in studies in architecture.

We have tried to do this more rigorously by entering all the data into the computer and working with a Professor in Statistics and Actuarial Science and unfortunately that project is not completed he is always so busy but we hope to do this in a much more rigorous way.

We've done it just for first year and it's definite correlation between success in cultural history of course and English literature, there is also a good correlation between high interviews and good studio work but the combination of the two is a very good indicator, we still feel that we are doing the right thing in having both the interview and the English test and the school puts a tremendous effort into this. We usually have each year almost an entire week where all the faculty except those on sabbatical, contribute. Each interview consists of two faculty members and two students, the students volunteering their time, upper year students and then we have a few more in May and those who could not absolutely come at all, you know, from very remote distances, there we allow a mail-in portfolio and usually there are some English assignments there too, some essays. We haven't yet got a successful formula for that one, we've tried different kinds of essays, you know, writing about your home town, and what buildings you like and so often people will go to the books and crib something, it doesn't work anywhere near as well as seeing the person, the people in person having them write this test.

How long does it take to do the test?

I think it takes about one hour and half.

And that's done in a private room or in front of people?

In the big lecture room that you saw, for example anybody who has an interview on a certain day is asked at lunch-time to go into that room and write the precis so the people who have interviews in the morning and the people who have interviews in the afternoon, they are all there together in the middle of the day to write this test. The ones who have their interview in the morning can leave after they've done the test, and the other ones stay for the interview.

I think that is quite a good system .

Well, we seem to think so, and continue to do it despite the fact that it's a tremendous amount of work for example hundreds of these precis have to be read by our cultural history faculty for example

and that's three people to read them all sometimes just two.

How long does that take?

Well, it takes a few weeks and then once the grades are in, all those essays and interviews then they are sort of matched, you know, top interviews and top precis get selected first and we sort of go down through the list. Sometimes you know when in doubt someone has a tremendous interview and a real low precise, if they are a failure precise, they might be re-read and re-assessed.

The interview with the students and two staff members, is that just a matter of showing previous work in a portfolio and discussing it.

That's part of it but the questions can be wide ranging, you know the obvious questions perhaps, why you went into architecture, but it may revolve around things that people have read. We try to find something in the students that can lead to a useful conversation rather than imposing on them something you know like do you know the works of Frank Lloyd Wright, instead if somebody's a good hockey player, well maybe we talk about that to see whether there are some insights into their world evident there, or if somebody just began or months before they came to do a portfolio, we might ask them about why they did certain things, what it means to them or maybe just looking at it can you tell us you know give us some real insights even though the technical execution is still at a lower level, but it's trying to draw something out of the person. Of course somebody who's fluid in presenting themselves obviously comes up. Well, the questions could be wide ranging, could be about somebody's knowledge of poetry, whatever leads they give you, then you have to try to follow up the leads and see.

And you're graduates then demonstrate an ability to work at a really high level for example you mentioned Renzo Piano. It seems to work, in other words, this system at the other end is working.

The school has produced some very good students, John Schneer who you met is a graduate from this school. He was kind of the Rome first prize winner, we have now a Rome prize each year, some young architect is chosen, you submit a portfolio and some intentions of what you'd like to do in Rome and then they select each year we have one. So he's an example and then the number of good architects and the other thing is our students are quite in demand so much so that our director has recently said the other directors in Ontario and two other schools of architecture in Toronto and Ottawa are complaining that we are taking all the jobs.

I bet that speaks realms.

It all began when I went to hear Michael Spindler former CEO of AppleTalk in Toronto and I met a person from one of the school

boards in Toronto, whose special job was in furthering connections with industry and a program called CyberArts that takes bright students and give them an education which of sort of what we don't do. Holistic, rigorous academically, rigorous artistically but also with computer technology included and so we are now making links to this North York board to get bright students and students interested in architecture to explain to them what's it about and although your not supposed to as a University go around and advertise yourself in schools, you get invited, we're being invited. Our directors went and talked to about 600 school kids telling them what architecture is about because you have to actively solicit also and spread the message and in the early days we used to go to several cities for interviewing also our budget cuts have meant that we don't do that any more but we used to get, even when I started ten years we used to go to Ottawa and set up shop in a local hotel and you know conduct our interviews there. Then we used to have some in addition in Sunbury a northern Ontario town . You know, the faculty would go to high schools and talk and then the University began a program of liaison in high schools and we would get every Monday some students coming over and one of us would go on duty and sort of peter down, and so it's probably good for us to go out ourselves on our own initiative but I think that's also very important both to have links and to explain what architecture is about, many people don't know and also there are misconceptions about our school, some think that being at Waterloo we are highly technically oriented whereas in fact we think we might have a nice proper balance.

Thankyou.

George Stiny: Interview by Dean Bruton

Massachusetts Institute of Technology, Boston

13 July 96

George Stiny is a Professor of Architecture at MIT. He pioneered the algorithmic approach to architecture and the visual arts using shape grammars.

Do you define art in the same way you define design?

It is better to apply the rules and not worry about it. At least I try to set the rules up so you can do that kind of thing. That is one of my concerns.

Would you jettison the idea of defining art and design and get on with doing it!

[laughs] Yes, doing things,—it is not going to matter what you call it. At the end of the day if you take an inventory of all the people you might call artists or designers, and things that were called art and design, and then look at what all that meant then you might have some definition of what the term is all about, but that is at the end, when it is all over, you know, when you are all dead or too old, it just doesn't matter. It does not have any force. Just get on with it.

That is one of the things that in many ways is distressing about some of the negative commentary that we get about grammars and computation, because people think too narrowly about it. They tend to think that it is a combinatorial activity, where you have got a bunch of your little pieces that you are moving around a board, in a mechanistic way, or that it is something like playing chess.

But it is not like that at all, computation is a much more general kind of enterprise where as much as the process is to do with picking out what you move and redefining it and constantly reconfiguring dynamically what you are playing with. It is an entirely different kind of situation, especially with.

I guess the negative things people say come out of Edinburgh now, they used to come out of Sydney. (Richard Coyne is now in Edinburgh)

Most of the negative stuff is a misrepresentation of what computation is all about. It is true if you look at computation in that narrow sort of way but it has no more general application because its view of computation is so limited, so narrow and blinkered.

Of course if you are going to limit yourself in that way you are going to get silly kinds of results, but that does not mean that it is the full extent of computation.

What exactly is the 'Edinburgh' criticism?

I get the sense that they feel that there is something more to design than computation, that there is something more to anything we do than computing. But again, their notion of computation is so narrow. If in fact that is all there is , then noone is going to disagree with them, but it seems to me that there is a lot more to it. It has a lot to with ambiguity and flexibility and the ability to change your mind in the process and to still continue,—it comes up all the time in the arts and that's why I think dealing with spatial material, or artistic and design material and computation is really very helpful and salutary for both enterprises, it makes designers think a little harder about what it is they are doing, artists to think reflectively about what they are doing, but it also lets you see that computation has much more general enterprise It has much more interesting facets to it than you might normally think when you begin with the combinatorial view (ie when you have got little units that you are moving around replacing the units that are always there) It is a kind of Newtonian view of things.

Blake who rails about Newton all the time and his atom is a perfect example of someone that I would think knows that computation is much more general than Newton had in mind, and yet really can't say it because he didn't have the technical machinery to talk about it.

But the things he says were spot on in respect to what can happen in a computation Just like things can change and reconfigure themselves as you go along, that you don't get with a Newtonian point of view.

To get back to complaints about design as computation,—a lot of people just think that design is that Newtonian kind of articulate manipulation that gets you nowhere, (laughs) but it is wrong it is more general than that. But it does not seem to come out in many places, but it does come out when you start to deal with design, art and computation together. It seems to me that that is what you are doing and it seems to me that you are going in exactly the right direction.

Would you comment on Donald Schön's work regarding the 'reflective practitioner'?

Schön is a perfect example of someone who is really talking about computation but does not know it. For example one of his main things is reframing, or as he called it, back talk. You are fooling around with a design and you look at it, you do something and you look at it again and because you have done something the whole configuration thing can change on you, it can become a business letter, an art review, a structural review, you can configure it in your mind you can see that in architecture all the time when you start with a plan and you draw the basic elements that you are fooling around with, then you look at and say Aha what if I look at it this way and changed it entirely, the lines are still the same, but the way

you are structuring it is different. Then you go off in different directions. Well, those are the kinds of things that I am interested in, in computation. To show that they are essentially approachable in terms of computational ideas and it turns out that you see the same kinds of distinction—well the distinction goes back al long time, all the way back to Socrates, the separations that people make.

If you look in more recent terms, I would say the distinction the Susan Langer makes between presentational material and discursive material:—Most people think computation is discursive because it is not fluid and plastic and flexible whereas presentational material is. Well, it turns out that I can show that presentational material can be handled with discursive devices and by doing it you can expand what discursive things are all about. You can show that there is really no sharp dichotomy between the two it has to do with, just to technical, algebra you are working in. Schön does the same kind of thing when he says lets be presentational about it. That is why he has this back talk and the reframing.

It seems to me that the key idea from a research point of view (my point of view) is to show that all of that is computational, and that is the direction I really push in, and it seems to me that there is nothing to keep from pushing harder only people's kind of prejudices and comfort at knowing there is something that computation can't do. I mean, people are comfortable with that idea. (laughs) And since they are comfortable they do not want to get rid of it.—and I think a lot of the time what I say a lot of times irritates them because it really saying you don't need to be comfortable with that idea, you can be comfortable with another idea, namely, that design is computation, enjoy that one but have a more general and generous view of what computation does than the one you play with which is infuriatingly narrow. It is almost humourous it is a gloss on what you can do computationally and yet almost everybody has it.

You seem to be referring to the view that often refers to say a spirit in art work, a Pollock or Rothko for instance, a quality that can't be reduced to ones and zeros or something like that?

It certainly can't be reduced to specific elements that are structured in a particular way. I think that is generally what people mean when they meant those kinds of distinctions, for example if you look at a Pollock, you can see it differently every time you look at it. There is no one fixed structure that describes it once and for all, that says this is what Pollock has done. That is the beauty and the joy of spatial material, it is flexible, you can look at it in different ways all the time. There is nothing that blocks that looking.

The problem with computation is that generally, the way people set it up is that everything blocks that looking. Once you have set it up in that way to go back and look at it a different way, requires a lot of work and a lot of looking and a lot of hoohah that is really irrelevant.

The key thing is to make computation so that it avoids that difficulty so that it is a s flexible as the Pollock itself. That is what makes it interesting.

The issue about whether it is ones or zeros is a misdirection really. Anything you stick on a machine is going to be ones and zeros but that doesn't mean that that is the appropriate way to think about it. It does not mean that that is the way you should structure your algorithms, because that leads you in the wrong direction. You should structure your algorithms in terms of the way the spatial material is working- which is different it gives different kinds of results. That is the kind of stuff I worry about a lot. So, really what is on the machine is ultimately just an approximation. It has to be an approximation of what is there if it is going to digital It might be a rich enough approximation of what is there if you can get the eenyweeny squares small enough. But it is still not the way to think about it, it is not the way you should think about the algorithmic structure. It turns out that that is the ultimate translation that you have to make but it does not have any implications for what you are doing.

What advice would you give to those people that think that way?

I don't know, around here everybody thinks that way. The MIT view is that if you take stuff and if you chop it up into small enough little pieces that everything becomes homogeneous an that you have to worry about the physics of the little pieces. Then you combine everything combinatorially and you get your result. Well that is a very powerful way of handing things in the world. It is astounding what you can do with that view. The problem is that that is not the view, that seems to me to be very productive when you deal with art and design. It is the kind of view people think is computational but it turns out that it is not the only view that can be computational. So that is where you have this kind of funny tension between designers who say I think that way and I applaud it, and then people who say well that is not computational which I don't applaud because it is computational. You just have to think in a slightly different way to make it computational. That is what shape grammars are all about. The problem with shape grammars is that people assume that the word grammar means that you have got fixed components that get combined together in a combinatorial sort of way.—and that is the long and short of it.

Well, that is not even the beginning of it, in shape grammars there are no fixed units that get combined they get defined and they get redefined as you are computing. That is what makes it different between the fixed structure attitude and the designer's attitude. So my advice is to keep doing it as long as you get something successful, but don't think that is the only way you can think about it.

How do you know when you have achieved a successful shape

grammar?

You get tired of working on it. (laughs) It is like writing as novel.

When I tried the Russell and Joan Kirsch grammar for Richard Diebenkorn's Ocean Park painting series I enjoyed the idea that one could gain insight into what one imagined was Diebenkorn's design process. This grammar is a selective aspect of his entire corpus of work that was defined for the purposes of making a grammar because we know that you can make lots of grammars from Diebenkorn's work, but, one point that I am wondering about is: Can you say the structural derivations are indistinguishable from the original Diebenkorn's?

The derivations aren't the pictures Diebenkorn produced.

When the grammar produces a derivation some recombination of the rules that were selected to for the grammar,—in the Russell and Joan Kirsch paper on Diebenkorn's grammar, for example, it had a small reference to the testing of results by experts: Do you have any problems with the degree of expertise required to validate a grammar?

There are two issues: one is, does a derivation give a definitive view of what something is? The answer there is clearly , no.

But the serious issue is not whether it is or isn't, the serious issue is what you have to do to add to the grammar or change the grammar to get another derivation that tells you something else that gives you more insight to carry on or expand what you have got already. It is just like criticism, there is no problem there.

Computationally the issue is, how hard it is to add a rule to a system that has done something. In most systems it is impossible. The reason being: suppose I thought of an artist in terms of squares, all my rules are defined in terms of squares. All of a sudden I see there is a triangle there.

Can we use Pollock as an example?

Let's talk about something simple.

Let's use Rothko?

Well,—go back to Pollock, that's easier in terms of what I am talking about. Suppose you look at it and you have got it configured it terms of particular kinds of units. And then you look at it again and you say well those are not really the kind of units that I want because there are some other units that work and I can write some rules for those to better articulate what is going on in some part of the picture. Well, that is fine, it is something you should be able to do critically, but the issue is: can I stick that rule in the grammar I have already got?

If you write rules in the normal way where they are written in terms

of vocabulary units and particles, the answer is no. There is a set of things that get manipulated and the new rule is a different set from the ones that you have got, and it does not even show up in the grammar—the grammar is blind to it.

It is a different lexicon.

Well exactly, but if you use a shape grammar, where there is no lexicon, where you have completely thrown the idea out the window and said "I don't need it, it is not part of the computation" that is, that you can set it up by imbedding all this stuff in the object that you are manipulating, then you can put the rule in any time you want so that the grammar itself, the computational process is as open, as anything you can do critically; as anything you can do perceptually with your eye or your ear, etc that is the whole point of it. But that is the point that people miss.

That is what I was talking about earlier. Their view of computation is too narrow. And it is too narrow because most of the things that they see are done in terms of these fixed units, in terms of a fixed vocabulary and fixed everything else.

So, the one answer to your question does it tell you everything is, that is about expertise, well, the answer is no it doesn't, but if you use a shape grammar it allows you to expand that or contract it or what ever you want to do, it is a dynamic kind of living breathing entity just like anything else that you do.

The question is what should your standards of expertise be: well, I did stuff on Palladian Villas a long time ago and showed it to experts, as expert as you could get, (laughs) and sometimes they say things that are interesting and sometimes they say things that are trivial and boring. So the question is, well, experts are where you find them—take them for what they are worth and get on with things. It is like defining art, its not something that you can come to an ultimate conclusion about.

But the key thing both to expertise and computation is to be as flexible as possible so you can add or subtract from it, or dynamically change the structural entities that you are fooling around with computationally as you are doing it. That there is no block, that there is no impediment,—

So for example an expert said to me, and they have one occasion this is not a plan for a Palladian villa, and I say to them, well, how would you change it to make it a plan for a Palladian Villa, and they say something to me and I say well, what you have said is just to add this kind of rule. As far as the Palladian grammar goes you just add the rule. If it weren't a shape grammar I would be stuck with what was there, I would not be able to add the rule. This is not saying the expert is it is right or wrong , just, "what are the implications of what he has said, what are the consequences?" The consequences

can be worked out in terms of a rule, or several rules that are implicit in the criticism or comment.

The next thing is, can you just add them by sticking them in without having to re-jig the entire computational edifice, or system that you ave already built. If you do then you are in trouble, because nobody wants to do it because it is too much work. If you do not have to do that, there is a very interesting dialogue, the conversation that develops between you and me or you and anybody else or me and anybody else, which is very much like the kind of conversation we are having right now. You can change the terms of the conversation- you can change your vocabulary, whatever, and that is something that can be handled computationally.

If that sounds like it is part of the neo-pragmatic view of the world, which is all hot these days, well it is, but what it adds to that view is that it is computational, that it is not above and beyond what we can do when we are using and working with rules.

Can you give me some examples of artists who appear to work with fairly strict rules?

Good ones. (laughs)—that is the answer.

Can you name a couple of specific examples?

I think there are a lot of examples. The history of architecture is really about people who are telling you how to do it. Of course, architecture is a profession itself, you kind of expect that. Palladio is a great example or Wright. There are two examples like in classical architecture, who have sat down and said "I do it this way."

What about artists?

Artists are a different story. If you look at the corpus of what people have done you can find some. It is not impossible, you can find some, and it is probably elucidating and interesting to try to characterise it in terms of rules, whether they are the ones they used or not. Whether they had any notion of it—well you are just guessing—there is no answer to it. The problem with artists is, at least recently is, it is generally unfashionable to say you are working to any scheme or have any idea at all.

Most artists that are good work too fast in the sense of being able to produce more things, one after the other. They have to have some set of rules that they are appealing to that let them work that rapidly. All you have to do is look at the difference between a student and an accomplished artists or accomplished designer. The accomplished designer will it in the click of a finger and it all looks stylistically consistent with what they have done in the past you can see links to it—it gets done. The student will sit there and agonise about it for six months and come up with a pile of rubbish, and not understand why, or why it was so hard or what was involved. That seems to me

to be a perfect indication that there is some computation going on and computation that is pretty well worked out. It might take the artists forty years to do it, to get to that point, but then the work gets defined and well known. It develops into a reasonable corpus.

Does the artists know it? Well I don't know.—Is any body going to say it? Well I don't know. — Is it an interesting way of looking at the material? Yes, I think it is.—Do you want to make vast wild claims about it, that everybody works to rule? No, I don't want to do that I think it is irrelevant. I don't think it means anything.

What I do think means something is that when you approach things computationally at least, in the flexible way that I have in mind, it helps you teach about it, it helps you talk about it, it really ups the ante about what we can do in a design school or an architecture school or art school. It allows you to talk about other people's work, it allows you to compare other people's work, it allows you to examine people—to say you can say do me another Pollock!—and you can do it. You can actually say, well if in fact what we have been talking about is what we accept then, you made a mistake here, is it an interesting one or a boring one. Shall we expand the Pollock notion in your way or restrict it or whatever. It opens up a huge realm of possibilities.

Do you mention Pollock as an artist that might have worked with rules because he worked so fast and prolifically?

Well it might be just the way he paints! (laughs)—but, yes, there is a definite reference to Pollock and what he paints, and what I have been saying.

Raymond Lauzzana, editor of the Languages of Design journal, says that Pollock was a really difficult one to make a grammar of because you would need, say, to use Aristotle's idea of the "organs of the animal", to find the organs, the essence of the work. Can an artist's work be too difficult to make a grammar of?

I can tell you right now that I don't think anything has an essence—with all due respect to Aristotle. Maybe that is why people find some of the things I say cavalier, but I don't think it gets you anywhere. It is just that somebody made these things somebody did them. If you are really interested in them, one way to understand what is going on, is to figure out how to make another one. If you can, well you have grasped something, that is interesting and exciting and if you have done it in such a way that you can teach it or talk about in a way that expands the repertoire of devices that allows you to make other things that are new and different then that is all to the good. If at the end of the day you jus say that it is too hard, and it has an essence, and you leave it at that, well- that is it, it is dead!—it is closed off and empty and you can stick it in a museum and people

can come and do the social thing and pay their respects, you pay your respects to the dead. (laughs) I am interested in moving on, the dynamic part of it.

I am interested in a contingent sense of grammar, that is when rules appear to be used, when they change, when there seems to be a sudden change in derivation, and how much rules appear to carry over from one work to another.

Those are all good questions. The issue is are they all questions that can be answered computationally. If what I am saying is right, then the answer is yes. That is the whole business about how you can add to the rules or take away from them and do it without having the computation itself block the process, of halting the enterprise. I think things change all the time, and that is what is so wonderful about what we can do perceptually and artistically. In a design mode. The issue is can computation change its path? The answer is I think yes, but not in that Newtonian sense that seems to blunder and block.

How do you see the place of grammars in making new designs?—ie, both, as loose analogy and formal system

If you really press me I would say they are both formal. The reason I say that everything is formal is that you can add to the grammar as you are using it. In fact if I didn't have that facility with a grammar then I would make a strong distinction. It is like the presentation and discursive stuff. What you are really asking me is whether the presentation is informal, loose, dynamic and you can change your mind along the way, and, the discursive stuff is logical, rigid, there are rules and you can't change your mind along the way.

Well it turns out that if you press it the distinction goes away. Most people don't press it that hard because they are comfortable with the distinction, they like the distinction. They like it because they can say there is science, but then there is the arts. They congratulate themselves that there is some realm that is different from what they are doing. I think it is all a continuum, a single spectrum of stuff. The issue is how you make it computational.

When is it useful to use formal grammars?

Always, because it is not an impediment. If it were an impediment you would see it being one because you used the wrong kind of computational system.

Thankyou.

Mark Tapia: Interview by Dean Bruton

Department of Architecture and Design, UCLA

2 July 1996

Mark Tapia is Associate Professor of Architecture and Design at the University of California, Los Angeles. His 1996 PhD thesis, *From Shape to Style* explores presentation and selection issues in the use of shape grammars to generate design forms.

What you understand as design?

Design is an extremely fundamental human activity and everyone of us in fact engages in it, and to paraphrase Lionel March, its really imagining possible worlds and restructuring the worlds each time and on each contingent occasion, so that's what design is for.

How does rules fit into your understanding of design?

Instead of just imaging every single possible world they enable you for example to hone in and to develop a rule and then to concentrate on which rule you are going to select or how you are going to acquire rather than on how you are going to do something with a white piece of paper.

Could you distinguish art from design? For example, do you think that design is computation?

Yes, but I also say that art is computation. I find it rather difficult to distinguish between art and design or for example between art and craft. It's too nebulous and it's really culturally dependent and historically dependent as well.

Derivation sequence according to rules is known as a grammar. Do you agree?

Actually the grammar is the sequence of rules, the initial shape and then you start doing some computation, the derivation then becomes a sequence of rule applications within that system within the grammar, yes.

Can you think of examples of artists who appear to work with fairly strict codes or patterns or rules?

Victor Vasarely. A lot of artists in fact if you examine their work closely enough, because they have a certain amount of style and they are recognisable, surely they must have some underlying deep structure to their work. Because we can recognise a painting having seen other paintings of the series we can recognise that it must have been done by this particular artists or sculptor, or even for example industrial design. It is also clear the designers favour certain kinds of colours, textures, patterns, shapes.

I am interested in a contingent sense of grammar when rules appear to be used, when they change when there seems to be a sudden change in a derivation. How much rules do you think appear to carry over from one work to another in artists work?

One would imagine that perhaps what an artist would do, is develop rules, apply them, explore them because there are a lot of sequences in which artists do a series, based on a particular concept for example. They will carry it along for a certain length of time and then they will change they will do some sudden shift or even slight shifts. They will see where the grammar will take them and what rules in fact may have to be changed, because they are not exactly turning out the way they want or they are bored with it perhaps.

How do you see the place of grammars in making new designs as a loose analogy or a formal system?

Well they can certainly make new designs. The whole point of a grammar is that you don't know what its going to do unless its really trivial which I guess there is no point in doing it. And if it is sufficiently complex then it will lead you to a rich but structured world, it doesn't have absolutely every single design possible. You normally have a selected set of designs but it will still be original for you to exploit it.

Do you think that the loose analogy of grammars is a useful construct?

Yes, that's right and you will have a tight analogy for grammar a tight one when you are first doing the process to get you started and then you can start loosening it up and changing the rules.

So you would rather move from a formal "tight" grammar to a loose analogy of grammar or would you work the other way around?

No I would go from a really formalist approach, I would loosen it up a bit but the way I might loosen it up is by using rules to loosen them up. In which case we are not really being that loose are we?

That's right.

We can use the grammar, we can use metagrammars, you could possible look at ways that people have changed their grammars over time and if in fact there is some underlying rule structure that manipulate the grammars themselves to transform one grammar into another.

Do you ever use computers as a medium for graphics for design? If so, what is or was the experience as a medium involving derivation and rules?

I have just done it in my thesis. I can see where it would be useful, from a computer science point of view, although this isn't really your focus, it's a sufficiently deep problem this whole idea of exploring

design spaces, where specified by grammars leads to interesting problems of a presentation selection. How do you present the choices? How do you select them, how do you make some kind of informed choices if there are huge numbers for example and this is a fairly common problem in fact. It's not just confined to the rule of shape grammars.

So this was a major problem ?

Yes, if it is a sufficiently complex one you are going to get large number of choices at any point so you need ways in fact of filtering them imposing more restrictions on the problem viewer

Other artists or designers or architects whose work you regard as particularly grammatical? Could you name a few?

Well I'd say Ed Moses. I would say if you just look at the artist long enough you will probably find some underlying structures. Although they may not actually use rules or be aware of that fact, in fact they probably are using rules. They are certainly using constraints. They are constrained by the size of the canvas, by the paints they choose, by the forms they use.

Designers, architects that you regard as particularly grammatical in their work?

Eisenman for example. He likes using rules, lots! Or just taking fractals for example and using it to build some. I think he tried to do some Centre for Biochemistry I think it was somewhere in Germany. Sometimes a few artists and designers and architects will use other sources for inspiration for doing, they can use external services and they can also use scientific sources as a starting point. It's just a way of reducing the design space and that's frequently what's been done using constraints or rules or grammars.

Thankyou.

Catherine Teeling: Interview by Dean Bruton

Greenwich University

Chilton Cunningham Associates, Studio 2 and Studio 3

30 July 1996

Catherine Teeling is an architect and lectures in the use of computational shape grammars at the University of East London.

Could you describe one of the projects you are working on, on rule based grammars and discuss how derivations and rules are used to generate ideas, to generate new designs. Is there a project you have been working on recently?

To generate new designs, this is an old project, this is a new project that I've been doing is, this is an old project and this is what I did my Masters on just looking at form generation, using a shape grammar.

I developed many studies using shape grammars and what I did was look at how useful they could be to a designer and how they could be more informative to a designer because before I went to UCLA.

I wrote a book on a MiniPascal that looked at basic rectilinear shapes, that followed the possible combinations of Froebel blocks, except that this program allowed the designer to choose where and when and how he wanted to place the blocks in the computer, so that it would record all of the decisions made by the designer and this would come as a print-out. They would know exactly where they placed it. The designer also would control over the height, length and width of the blocks so there was a direct proportional representation between one block to other block so it's not straightforward but Froebel blocks and the ratios of those but under those transformations still, but it relates to a design like say, I want a block that is six metres by one metre by four metres and I want the next block placed to it top face to be equal in area or half the size of the bottom face in that block. So there is some kind of property relationship not only where it is placed but in the size of the blocks and it could be identical or you could set it to be totally different. So you could say no I don't want it to relate to it in anyway I want it, and it was really to look, explore whether Froebel blocks could give any feedback into proportional relationships between aspects of three dimensional shapes, in their generation process.

So you would choose it, it only went to choosing two rules and the generations could go on, perhaps it was only more or less practical to go up to eight, because then it just gets too big and out of control. [shows project to camera]

These are some of the generations from that program and this writ-

ing here is the feedback. This was a presentation sheet and you can see a very cluttered presentation sheet that shows some of the generations and a small inscription in the middle and this tells you exactly what the designer chose and these are the designs that evolved with just letting the program run.

So we got repetitive elements, overlapping elements, again kind of repetitive but in some kind of formal structure and I introduce colours so that rule one and rule two in the applications, could be seen and the starting rule, the initial shape was always in red, so you could see whether you wanted to put it down or up, around or to the side.

Then the idea was, I have another program called Evolution, but this would be used to, like the Froebel blocks were used to generate ideas. If you could ask Terry Knight or see what she does with her students and they do a whole array of designs using Froebel blocks and they'll start controlling them.

Well here you start with, especially if you have an understanding of Froebel blocks and shape grammars and you choose the dimensions that you want, choose the relationships and you get a whole range. It prints out,—you get a whole array and on the screen you get a whole array of all the generations, so it shows you each of the generations states which you then can select from and manipulate.

[shows example]

If you then were to take one of these from the generations, say for example, here you have three of the generative states or I think this is actually one here, it shows you the generative state in plan form.

[shows another example]

This is the same one but in different view points, this is the final one in different view points, you can then select that and play it into another program, let's say Evolution and what that is supposed to do, but it never worked as well as I would have liked, it needs to be tinkered with, you would work on the blind watchman theory that you have blind states and this shape will then be put in the centre and each one of those will control it in another way. The designer would write in, like I wanted to explore heights buildings. I am quite interested in this form, because there is one on the site; that does it, yet certain elements need to be elongated, so depending on if it would lengthen on the second generated or whatever,—and they could actually control that themselves, they wanted to explore different aspects of the design and relationship of the object together and then that would generate lots of different spaces.

[shows another example]

This sheet here actually shows some of that, you can see these were the cubes which the shapes were placed in, this is one of the forms it

was placed in and it actually distorted forms in a particular way depending on what the designer chose, once he generated. And I think things are ultimately created from this beginning of establishing a relationship rule and letting it generate and then selecting in his book, William Fawcett says, whether you have a range of ideas and then you select from it, I think things are more creative if you actually generate the ideas from which you then could select and start developing and reshaping in another way and all these could be described as being another algorithmic process that kind of tinkers with design and the processes like these.

[shows another example]

Here again is just a sheet that shows the diversity of the forms that come out or could possibly come out of this process either quite tightly controlled boxed shapes formed together or quite spread out, elongated, tall or average, between the two there.

When was that done?

Almost three years ago, and its been tinkered with, now that was written *MiniPascal* and generated then with *MiniCAD*.

Does it have a name?

No, I just called it "A Creative Design Process" and it was exploring the creative design process and part of the thesis was dealing with creativity of designers and I looked at aspects of designers and what made them more creative. The idea was that the program, the computer program should respond to the creative aspects of the way in which people think and operate. Designers, not people, think and operate.

For example?

Well I think shape grammars do that, I think it does explore the intuitive side, things that designers do intuitively and yet can't explain, I think shape grammars do that and give them some explanation to what they are actually doing

The way in which this [project] relates to the creative side of designers is that it allows them to do more backtracking, it allows them to search down the path, let something run and then to come back and do something else to it. Sometimes it is good to go down the wrong avenue, you don't have to always be following one path and expect the right solution., You should have done this by taking new avenues, new directions if they are relevant at the time and you might actually find some solution to a problem by doing that. You can actually bring that into another part of the program. But this is one part of an overall program which I am now looking at and writing in C and C++.

And that will develop this to account for designers intentional vision or inspirational idea?

So then they can take that into a graphics package as well and do something to it, the idea is the way in which designers like to operate is to be able to move around these environments, take what is necessary and change things and alter and start to control it.

Is there a more recent project you might discuss?

This is an ongoing thing, the recent project is really what I am doing with the students at Greenwich and how they love looking at design analysis. How they are taking part of their exploring of the urban environment in mapping of the open environment and shape grammars mapping, so they are exploring morphological form They are representing that, by establishing set grammars to represent part of the open fabric so that when you come to design a green field site you are benefiting, because you can then apply grammars rather than just gridding the whole site or putting a patchwork of forms on there that what is controlling the grammars are certain theories established by Jane Jacobs, Kevin Lynchin, Image Mapping so all various theories used in a tentative way can actually be done by most designers when they are designing cities, can actually be used in a more productive way through shape grammar generation.

Are there images or examples one might show for that project?

[shows example] These students decided to look at a social grammar about the placements of residential, industrial, commercial, recreational themes within an environment and if there is some pattern to the way in which they are organised, within an urban framework that makes it kind of more successful and this was being supported by Christopher Alexander.

He did quite an interesting one because of his pattern language, but in some ways there is something that he gives to you to use. He talks about a distribution, but what I am interested in:— is whether by analysis, is there something, is there a pattern, is there some level of distribution of form that makes it more successful than just placing one down. Looking at some kind of figure of distribution. There should be ten in a area of something so large. Rather than looking at it that way, how are they dispersed, there was no real guide to that.

But if you looked at a map of London you could see, identify the various periods of building blocks, blocks of buildings have a kind of grammar to them.

Yes, you can do that, it is not as easily discernible as that and that is where space syntax comes into and this is how we try and marry the two together, space syntax being the analysis of the social use of space. Through a space syntax analysis you can actually see where the actual dead areas are, the less connected spaces are within the city. You can look at the actual pattern of that and you can see very effectively what is going wrong and you can, and if you want to reform that you can use your intuition and start breaking up the

form. You can actually take through some grammatical analysis, a bit of fabric and relationships that are important and establish them to the existing site and to question. If you look at all the sixties housing estates in London and see the patterns of social behaviour.

As you may know I am less interested in grammars as a means of representing the designs of others in the past than in the relation between the concepts of grammars and the process of making designs, especially Donald Schön's idea of the reflective practitioner. Could you comment on how designs might be generated with a reflective component and, to what degree does reflection and reflective practice come into your experience with shape grammars with your own practice perhaps and your students.

By reflective practice you mean through the analysis of previous work, is that what you mean?

Reflecting on what's been done and then altering it and then reflecting on the alteration and altering it and then reflecting on that. Does that happen or is it happen in your experience?

Reflecting on works at any level is important and it does happen, its perhaps not ever been expressed as well as that. It just tends to happen. For example students who are using the shape grammars, three dimensional grammars in generating design which they do, they look at, they do an analysis of housing, social housing in one of their schemes. They use a three dimensional grammar to generate housing and they go back, and they generate such forms and then they go back and reflect how is it going, how well does it suit the site, how do they need to control it, what do they need to change, why should they change it, they bring in all the design constraints and criteria of that site and the brief and use that to modify the design. But that is nothing new in any design process, that's quite normal. It is new to the students because they are doing it to a set of abstract shapes and first they sort of think, this is so abstract, why am I doing this, its not going anywhere and no matter how many times you say it, that is doesn't matter where the idea comes from initially, you are quite happy to go into the library and look at a magazine and see Danish buildings and think I am going to do my research on Danish, I am going to design Danish for the rest of my life, for the first year in architecture and why not its such a good mouthful, yes. They are quite happy to do that: not see shapes and forms for example, and they say "I'll take that." But the feeling to use grammars to generate abstract shapes,—there is this kind of hesitancy about whether they should use that and "Isn't that abstract and obscure". They forget that they are the designers and they are the ones controlling it and it is up to them to make decisions. The fact that they see a shape and form used by Danish in a particular way, they might use it in a totally different way at the end of the day, who is going to criticise you?

If it works, if it actually works in its context to follow through the whole of the design and with its transformations and modifications from whatever direction and it works. What is the problem? There is no problem. That lesson is a difficult one. You think that that is the main stumbling block. Its not reflecting on the design and modifying it, that's an normal process. It's the actual use of the grammar in the first place that they kind of have a problem with.

When I introduced it first as just a workshop for diploma students a couple of years ago and they didn't have to do it, there was quite a lot of critical discussion, but very little action. I wouldn't accept that because there can't be that critical if they haven't explored it, and if they have some sound criticism, but it all came from this kind of intuitive background, "Why doesn't it work and why do anything." I think it's also a sad statement about the level of students we've got as well, that they don't push things, they don't get captivated enough to actually strive to achieve something and put something forward.

Can you think of some examples of artists who appear to work with fairly strict rules,—artists/designers/architects?

Artists, who work with strict rules... I am not sure. I suppose people like Miro would be quite strict although he's very abstract and people, say Theo van Doesberg, people like that I think would have worked with quite strict rules.

You know I am interested in a contingent sense of grammar, that is when rules appear to be used, when they change, when there seems to be a sudden change in a derivation, how much rules appear to carry over from one work to another. How do you see the place of grammars in making new designs, both as an loose analogy and as a formal system?

I think grammars can make new designs and innovative designs. I think that is quite well established, it's a fact that they do do that and it becomes part of this kind of iterative process. Yes they can and they can make quite an extensive range of new design and new ideas.

The things that Terry is looking at is about how she is controlling that. With her latest paper on the three dimensional grammars and how by the actual relationship of the shapes you know which ones of those rules of a certain generation are going to be repetitive but as a route for exploration of new designs its quite extensive.

So do you think it is a useful approach for artists?

Yes, I think it is useful for anybody to generate ideas because it can be so prolific.

As a formal system, when is it useful to use formal grammars?

As a formal system?

Formal, very formal grammars, not the loose analogy of repetition or transformation.

In pure replication of an idea. I think there have been interesting studies and they have shown a lot, they've shown it can happen and it can happen to most diverse forms. They have actually been demonstrated through formal architects that have used the formal processes, Mogul gardens, remote Palladian villas. Maybe it's easier because things have been written down. I think it's value comes in representing, in a formal way ideas, the designers establishing their own ideas and particular criteria that control things, not that that is true of the urban environment Design ideas, if you're generating social housing and there are certain criteria constraints in an architectural world that are there and you have to deal with.

I think many of the formal grammars can be written into a program to actually control practical aspects of the site and the physical environment. I think they'll, I am not saying they're not of any use as papers, as they are, but they'll be of more use in a practical sense used in that way in some sort of computation program there is more benefit to architectural practices.

What about in the art field? Can you see it being useful, formal grammars being useful in the art field?

Yes, I think they are useful in establishing, they can establish what that particular artist or theorist or designer was about. My problem is slightly with that: one of my students did a little study recently on the Frank Lloyd Wright Usonian housing. He looked at Koning and Eisenberg's grammar and there's a well written paper and it will work and it generated a range of Usonian houses called "Stiny, March and ..." I can't remember which one it is now, but I said to one of my students, based on the John Rollo paper, "Don't forget, Franklin Wright used this special triangle." He used that a lot in his work and he explored all the shapes, in Franklin Wrights' Usonian houses and could actually explain all of them through this 31 degree and 69 degree angle, he'd define each of the points and he described the whole building by using this triangle.

He then did it to the three produced through the grammar from Koning and Eizenberg, and there were major flaws in the design, yet on paper and through their grammar it looked like that worked and it appeared that they had taken on board the principles of that designer and that's the idea.

I think that's something that was always omitted in those papers, that fundamentally the rules aren't as abstract, they are abstract, but they are only established because they relate to the principles of the designer. They got to, else they wouldn't work, that's in my opinion. What that demonstrates is that they didn't, those rules don't, so do they generate Usonian houses when the student found that certain

corners and relationships couldn't work, didn't relate to this triangle and yet all of his previous designs did?

This is also one of the major criticisms of Palladio's grammars which where produced by Paul Richens who said that, he didn't think they related to Palladio's real work at all and others have said similar things about "the" Mitchell Palladian grammar.

I know Stiny was testing that out, wasn't he by taking it to all the historians and saying well with the range of Palladian villas and saying show me which ones are and which ones aren't and they failed in that test. I am not out to criticise anybody really I just think that it's useful work—whatever. I like the work of Koning and Eizenberg and the fact that what it shows,—I am not sure what it shows,—it shows that grammar didn't relate to the principles, yet in some way it still generated what we perceive as being Usonian houses. But it didn't operate the principles of Frank Lloyd Wright, so therefore they wouldn't be ultimately of Wright, but it therefore represents new ways, it honing on other qualities and maybe that's their intuitive response to the qualities of the Usonian house not Wrights'.

That's not a condemnation of the rules or those grammars or anything like that, it's just another aspect of it.

But what it is showing is, that many things can be expressed in different ways, designs can be expressed in many ways and represent different aspects of designs and I think that is important.

Can you describe your experience using computers as a medium for design, mainly involving derivation and rules?

I think computers are useful to automate the process of design in the formal grammars and allowing that to generate, it's an automated process, generating, the important thing is that is has some specific relevant context. In computers they do things faster, so as long as what is encoded within the rules and the relationships and connections in any program that it's relevant criteria for me as an practicing architect and as a teacher of design, that there is more relevance to it, more knowledge of design and the direction which one wants to move can be hung on the connection the rules and relationships.

Some people, like Terry Knight, said to me, "I rather not use a computer, better a paper and pencil" for example, but you have no problem with using computers to develop derivations?

No, I draw on a computer as well as I draw with my hand, so I teach students to do a mixture of both, I don't think one should do all of one and none of the other. I make the students do three dimensional grammar models and I tell them not to do it on the computer cause I feel they have to feel the space and when I teach computers they have to, I am more interested is in computation, I insist on mixed media and that is literally what it means, I insist on some paperwork, drawn by a hand, models made by hand, models made in the

computer, graphics in computer, graphics made by hand, it's just another tool, it's not the answer.

Are there artists, designers or architects you could list whose work you regard as particularly grammatical?

I suppose Bruno Taut, Peter Eisenmann—modern architects who I would say are particularly grammatical. Palladio, I think that is grammatical, I think plays by rules and Frank Lloyd Wright and that's why I think I would like to see more papers on Hans Sharoum and people like that. I am writing a paper at the moment, a three dimensional grammar paper on Eileen Grey because although she is a very methodical designer, she was always very pragmatic and I think that she might be a little more interesting. and I think it's time to see more grammar papers written on diverse works, I think the works at the moment are formal people anyway and I'd like to see a little bit more Bruce Goff, anybody who is kind of wacky or has a different kind of expressiveness and even if it's only a small part of their work, it's so complicated, but all complex systems have simple beginnings I think you might actually much richer background information with somebody like that though it is harder work.

Would you agree with the statement that "Design is computation"?

I think I'd rather say there is algorithmic design, to say design is computation that is a process, design is a process and it's a ever-changing process, so you could express it as being computation.

What is art, in design is computation? How do you distinguish art from design?

I don't think you do. They all operate around fundamental principles, all aspects of design, the way it is represented may be different and there may be some element of care and practicalities architecture has to deal with but in its control of the three dimensional form, that transition from one space to another we are trying to hone in on some spatial qualities that two dimensional art is trying to represent in a different way. They are fundamentally different because of what they are but the principles that they operate from aren't that different.

Could you name a work of design that is a work of art?

You could say anything really, I could say any building to me would be a work of art.

For example?

The Richard Meir building in Ulm is a work of art. It's a sculpture in a medieval city, it's just placed in the side of the square and is set so I think. I think perhaps what is going to actually control it more famous as they are as well, more scope they have to do it.

I suppose the Fire Station by the woman..., her name escapes me

only because she has slagged off so much. Hans Sharoum's Berlin Philharmonic building, that's a piece of art.

Two points I want you to comment on. One is Chomsky's idea and the idea of natural language and natural language grammars, how does that map on to visual language and does it, or was Chomsky wrong? Is there any part of it that you think is useful from the Chomsky natural language model that can be mapped on to visual language?

I don't know much about it really, but my interpretation of a natural language is some kind of natural expressive form. I can't imagine that they wouldn't be incompatible or that there couldn't be some of connection between the two.

Would you say that visual language could be a powerful as say, music? Could you have an example in visual language that was as powerful as a Beethoven symphony?

One of the problems that came up was that in music there seems to be a very detailed description of all of the elements of the lexicon, whereas in visual language that's still not articulated sufficiently.

I think that's true, I think there can be, I don't think people articulate it, but if you are looking at repetitive notes having an impact at a particular point in time and creating some sense you can pick up things within buildings that mirror that kind of effect. I think it isn't articulated as well, but I think that is probably because architects are less aware of the way in which they all construct a building because they are not taught to have that as a language, they are not taught in a formal way. In architecture schools there are certain theories and processes that students go through and in some ways it tends now to be a little bit more abstract and you see this is a definite failure in a lot of architecture schools in this country where they don't actually make the connection between process, product and the representation of that, and not only answer it in a brief but in its aesthetic and dramatic sense of space, transition of space, can effect a person moving that space.

Can grammars provide that kind of detail of visual language?

Grammars can make them aware certainly, it can make them very aware of what the elements are that you actually playing with. I think that is because, it actually in some way it deconstructs the forms in order that they can put them together in various ways, it can allow them to explore a whole host of connections and different relationships but they have to have a sense of, and I think Terry Knight said this, "The better designers do better with it", and if they are actually connecting with that—it's not just a set of abstract shapes and we can make something look good and respond to it, but why would you want to do it in the first place? What movement

from one space to another are you actually trying to form? It wouldn't necessarily be in the way that, some of the designers have done better in Terry's programs. I think she might say this that in the better design you may have seen it where you tend to have these special roofs, that designer was making changes at different points at different types of rules for a different affect at a particular point in the building, so he was controlling it, but he was still keeping with a tight constraint to the rules, but ultimately, whatever point he put into the rules it can be just one instance of that and actually totally change the whole shape and form of that arrangement.

I think grammars are a very useful tool in the way in which designers can learn about the language of architecture and ways in which they can express themselves through this language in defining qualities of spaces and forms. I think that is essential for an architect, essential for a designer. I think they don't have that expressive power through traditional methods. Those that are very talented will, because they are naturally engaged with the subject. For those who aren't I think that that's where it has an importance in a way because those who can be good architects because architecture requires people with many different talents they'll be good architects but maybe they're expressiveness of a particular design intent can be strengthened through grammar, which maybe they haven't been necessarily able to do.

Thankyou.

Robert Venturi and Denise Scott Brown: Interview by Dean Bruton

Venturi Scott Brown Studios, Philadelphia

20 July 1996

Robert Venturi and Denise Scott Brown are internationally renowned architects. Venturi wrote the seminal anti black box modernist book, *Complexity and Contradiction in Architecture* (1965) and more recently published the book *Iconography and Electronics upon a Generic Architecture* (1996).

My PhD thesis is called *A Contingent Sense of Grammar* and your work on contradiction and complexity in architecture is appropriate for study because it seems to apply rules,—using the ideas that one ought to know the rules before one can break them and, that rules were made to be broken. The PhD demands a knowledge of the loose analogy of grammar as wells as the formalist approach to grammars. I want to discuss the idea of using strict rules in your work; then the idea of strict rules in artists' and designers' work; how rules apply from one project to another. In your new book *Iconography and Electronics upon a Generic Architecture*,—the phrase "in context" sounded very situational like the title of my thesis. So may be that's a good place to start,—Do you see your principles carry over from say, one project to another? Are there rules that you use in your work?

RV A very important point in general is the element of context in architectural composition—that was my thesis which was presented in 1950 at Princeton? The subject of my thesis was context and more and more in different ways context becomes relevant.

In my own way, I was saying context—we should look at line drawing on discovering Gestalt psychology perception, which said, among other things, meaning is derived from context, but context gives a meaning. Over simplified, but it is relevant. Obviously the red square in a white background looks different from a red square on a field of other colour.

Where context now becomes relevant in another way is, that it does connect with multiculturalism, which is a worn out phrase now, but still relevant where we are saying context is related to the particular physical background of the building—saying, "Look here is a historical setting and you ought to connect with it." Obviously if you can connect, you get harmony with that background, either by contrast or analogy. Now that was misunderstood a lot where they just sort of see an analogy with historical oriented circumstances or people. That is, you do a colonial building in a colonial setting, a Georgian building in a Georgian setting and that was all very elusive. It was more or less perceptual—visual background with context that this

was all about.

Now there's context in terms of symbolism of many cultures so that the building very often can connect with the culture of the particular places and time. Therefore that means you don't have one grammar or one vocabulary, you have, many, in every different context, every different culture, that stimulates a building with a different vocabulary. So you no longer have the universal ideal, lets say of the Renaissance or of the International style where the Renaissance—the classical Roman vocabulary, was appropriate anywhere. In that early period you built more or less building similar buildings in England, France, or Italy. We also know that we can always tell an English classical building. You can distinguish that from a French one, but the ideal was that there was a universal language. International style does not say this, but there is a universal language of its own: Industry—the industrial process is relevant all over, its universal and therefore our architecture will look the same, as essentially Mies van der Rohe would look the same or essentially as Le Corbusier in India looks more or less as it would, in Cambridge Massachusetts. May be they might vary and some details would be a little more emphasised but that was almost incidental.

We're now saying that the universal approach is not there. We are at the same time saying, there is in each of these different contexts a grammar that you set up. There isn't the one grammar, but there are grammars ie things that become grammar, with a vocabulary, and therefore there are rules that are set up.

Another idea that is important to our thinking is mannerism. We consider mannerism as generally appropriate for today as a manifestation of the complexity and contradiction you will experience in our world. Mannerism in one definition is, in a sense an approach which says, "It's okay, you set up the rules and then you can break them".

A lot of deconstructionism, assumes to some extent that a contradiction is all over, that is breaking the rules is constant: there are no rules. And that of course, is not mannerism, all inconsistency becomes consistency. So I guess I am bringing together all these things. We do believe in grammar. We do believe that there's not a universal grammar, but the grammar is effective on the repetitive areas of practice. The grammar is affected by context; cultural and formal situations; and the mannerist aspect that we think is the element that is part of our age of course its complexity and contradiction, is relevant. So, yes we do believe in grammar and we do believe in breaking the rules—here gently or sometimes very decisively, but naturally it has to be done—the breaking of a rule has to connect with—there has to be a valid breaking of the rules. If it's a breaking of the rules for aesthetic or ideological reasons without validly connecting with the architectural situation at hand, that becomes bad, picturesque etc.

One of the little things I get into is that we are feeling very much that shelter is important in architecture as an element that has been forgotten. We learn a lot from that from eastern architecture with the importance of a roof that is for a protecting a delicate building. It gets away from the sculptural kind of direction we encounter now. Shelter does affect the vocabulary that you adopt: you adopt and then you adapt. Its generic. A grammar does connect with the idea of generic, which is also something that we been talking about and again we are reacting against it the idea of extreme functionalism of designing the building like a glove. For every finger we say, "Design it like a mitten", so different things can happen and adapt over time inside and the generic is very important to us. The generic essentially has been part of all great architectural traditions. The designer of the Pantheon or the Parthenon did not get his thrills out of making the building extremely different from the designer of Doric temples at Paestum. The Italian Palazzo is the same for centuries in terms as a generic building and generic ideas connect with the idea of consistency of grammar.

DSB I think we could say how we got there and I am thinking of two illustrations in a way of a grammar. If you look at the retrospective exhibition of famous artists, you'll find they look like their masters and they look like their friends. Cézanne shows very strongly how eventually they grow into themselves and they develop their personal grammar. Cézanne developed several. You can see them running in parallel with each other in his work and they are there very strongly. It's interesting that at different stages his grammars became whole learning exercises for other artists, who took a certain grammar as a point of departure. There are people taking off from Cézanne in a sense, using his several plans. So, there's one kind of a grammar.

I remember the artists story of Norma Evanson, who studied at Harvard, but taught at Berkeley, who said that the architecture students at Harvard were thrown into confusion by the faculty, who told them, "You have not understood the industrial imperatives of the technological society". And she said, "If they'd just said you didn't design a Harvard box, they could have understood".

So they had a grammar, it was the Harvard box, but you weren't supposed to have a grammar, so you were meant to derive the Harvard box out of the "industrial inheritance of a technological society". Well that is much too broad a mandate for ever arriving at how to do architecture. Thinking about those and reading, there was a piece by a Professor Collins (I don't remember which one), about grammars and poetry of vocabulary and architecture which appeared in the early sixties and that made me think very hard about the fact that form follows function. It seemed to me that a lot of people distorted form to make it look functional when it doesn't function, it was a distortion for an unadmitted decorative purpose.

People had in their minds a grammar and they were going to, in some way, there was a function that made them produce that grammar. Rather than saying, "I have a formalist approach, which is looked upon as irresponsible". The word *formalism* always went with flashy or irresponsible, never with responsible. But they were formalist, but they try to say that it was all done for functional reasons and also for sculptural reasons. So we were in revolt against that and thinking, "If there are forms, we ought to understand them". In *Learning from Las Vegas* and a few articles I wrote at the same time, we followed that line of thinking.

We said that, "In fact architects have grown tired of the purity of modernism and then have to find again functional reasons to hide behind, instead of admitting they all tried to do something decorative. Once going to New York by train, we passed through New Brunswick, which then had wonderful old buildings along the railroad —industrial warehouse buildings. Now coming from the AA of London, I had been admiring those industrial warehouse buildings for a long, long time. I always think of the past as the AA students would have said, "Utopic architecture, has their weaknesses". So the decoration round the front door or recurrent capitals was a weakness that wasn't there.

This time, passing these buildings in the train, it suddenly struck me, "That's a very small amount of decoration and just think of how we're distorting our buildings in the late 1960s for a decorative aim we won't admit. Aren't these people more honest with a little bit of honest decoration? So I began to rethink that question.

So in that was an acceptance of a notion of a vocabulary, one that included also a decorative aim, but whether or not it did, but you can't put together a building just out of function and structure. You really have to have some grammar for doing it, as you need grammar to write a language. You can't just go from idea to a set of words there's syntax, there's grammar, there's morphemes. All of these aspects of language which can be applied roughly to architecture. So that's how we started and we found Alan Colhoun's article, which seemed to us very significant and he said the same thing.

He said that, "You don't get from function to form with," as he put it, "an ancestral intuition." There was something else in there as well. This was in 1960s and we began to realise that architects were caught by a grammar they would not admit and a decorative aim they would not admit and was holding them back from answering very functional problems. If they could really understand that they needed a grammar, they might evolve more suitable one. Then we began to think, "What is it that makes grammars change"? My theory is from that time. Our grammars were changing because there was a new atmosphere in the air and it had come from England where that had been true and then Brutalism evolved out of that. I was associat-

ed with Peter Smithson in England and Alison Smithson for a short while That was at the time when they were kind of looking again. Le Corbusiers' "Eyes that will not see", and they would try to get open their eyes and they began to looking at commercial architecture at that time.

But it was to kind of break the grammar. Find a new one. And this was in the sixties in America where we said, "We think social movements need to change in sensibilities, and then when sensibilities change, and our little thing can happen, catch your eye and make you realise a new grammar. I think that's what happened with us. And that was what caught our eye to Las Vegas and began to give us a new set of forms, a new view of decoration and finally a realisation that symbolism was an important part of architecture. As we started to analyse what was it there that caught our eye and gave us a shiver. It wasn't even we loved it. We don't know if we hated it or loved it, but it caused something to change. It helped us—it jolted our aesthetic—got us out of a rut and into a new way of thinking. We had a marvellous time in those days, Bob and I, playing a game, which said, "I can like something worse than you can like", which was again: challenging your own grammars, saying, "Now we're doing the 1950s". All that terrible stuff that we hated in the 1950s, perhaps its good.

So, I was reminded of Sottsass and how his material use were reversed.

Yes exactly, and that was all part of that. Now this is a time gone by and people took the wrong lessons from what we wrote. Saying that you should admit decoration didn't mean that you should go criminal and that movement which derives from what we intended. We think there was quite a strong social basis to what we were saying.

Are there any rules that you can identify that you kept from the earliest times?

I can show you plans that start with Bob in his mother's house and in embryo you'll see a way of thinking about the development of a plan, that I think goes through to almost everything else that we've done in this office, and it's grown. One way we say, if you're a creative person, you're lucky enough to have one idea and then you take that idea and you grow it and everything else happens to you, it builds on this idea and takes it different places. So I would say that with us, you can certainly see that in the evolution of other work. On the other hand I think that again, we have several grammars and even some evolving ones now, and it would be nice to show you some of those, and to show where they're similar and where they're different.

Can you think of any other artists or architects that are particularly grammatical?

RV I think you can probably can say that an artist like Richard Meier, where all his buildings are exactly the same kind no matter where they are. There really is someone who consistently carries on the tradition of the universalist theme. The other funny thing is, that there is along with this idea of engineering industrial vocabulary, there is the idea: "Oh, we must be original", to be a great artist you must be original. That is the kind of romantic idea where they always sit up in the ivory tower and talk about harmony in society. I think that the original Mies van der Rohe said something very pertinent, "Id rather be good than original." And there's no question that much of the great art in the past is great because it is good. Michelangelo essentially carried on with the same architectural vocabulary that was existing at the time. But what he did was give the relationships enormous tension, so there is a contradiction of in this thing of trying to be original. On the other hand there are formalists and formalist play of languages like where Meier's being consistent in terms of vocabulary.

There is very much like Denise was saying, the issue of, besides shelter and besides generic approach, there is the element of ornament and iconography. I talk a lot about it in the first part of *Iconography and Electronics upon a Generic Architecture*. I think that's something else that's interesting, where the modern essentially went along with the modern art idea of abstraction and that was quite a bit of getting rid of you know,—"We don't want any association, we don't want any symbolism." All that stuff that is sentimental and historicist and all those things. Of course they probably were using the industrial vocabulary, which is symbolically significant. But they didn't admit that. They were saying I just use function, but the abstraction is something which is still with us and that's when they got rid of graphics, iconography and ornament. Then there was abstract expressionism in painting and that's kind of where architects are now, to a great extent, they are being kind of like abstract, but also highly expressionistic in their original configurations of form. The idea of applique form on a building is something—and how it connects with grammar, I don't quite know. I think what you'd say is that the grammatical part of the architecture is found in the generic shed, the generic shelter and shed.

DSB Except there's another element of grammar.

RV You have the applique upon that of iconography or ornament, which can be grammatically connected to past configurations and can be highly original.

DSB But there is a grammar of how you put the applique on a shed, that's another kind of a grammar. There's the grammar of how the street go through the building,—of how the public spaces relate and how the kinds of unique spaces relate to the thematic spaces. Some are paragraphs and sentences.

RV Is that grammar?

DSB I think that's a grammar too.

RV Because I think about it more as a...

DSB It's a set of rules.

Derivation sequence according to rules, is known as the grammar.

DSB So I think you can say there's the grammar of the phases within a sentence, but there's the grammar of how the sentences go together and how the paragraphs go together.

RV I am a little confused, because I was thinking of the way that would relate more to content than to grammatically means or methodology.

DSB Look how we got—a way in which we put facades or ornament on the building.

RV In layers.

DSB Yes, that's one of those kinds of grammars.

Really, this is about form making and rules for form making.

DSB It is also, in our case, representation making, symbol making. and rules for doing that within the form.

The grammarians argue that, "If you get the rules right, the "hidden things" like say, with a Rembrandt or a Pollock, or a Rothko, emerge with the right rules for form making anyway". So if you apply these rules, which are form making rules, the emergent forms will still hold the meaning, the spirit, the otherness, the whatever it is that's supposedly is not computable. That's the argument anyway. Do you agree with that kind of approach? Can you see that happening?

RV We rather specialise in getting the rules wrong a bit. Not totally, but somewhat. That is, you set up a rules system and then you break it. So if you only follow the rules, you might not get the energy that you got from having rules and breaking them. And I don't know whether that formulation that you just described covers that kind of situation.

There will be a rule that said, "Break the rules chaotically every now and then". Or reverse every now and then, or...

RV I think there are moments in history where breaking the rules do not make sense. I mean, I would be very careful to say that as another philosopher might. I am not trying to set up a way for all time. One thing for our time, which is one of enormous complexity is that an architect today works for enormously different kinds of people. An architect in the fifteenth century Renaissance, was an architect for a relatively small group of middle class people.

DSB More of a homogenous group.

The ideal was homogenous and that was something that is not part of our time.

DSB We do like Paestum probably more than Selinunte, where the rules haven't quite formed yet.

RV Well that's right, but the point is the breaking of the rules can come from our own time.

There seems to be within the way you set up that first essay of your book, *Iconography and Electronics upon a Generic Architecture*, the idea of dynamism, the idea of fluidity that you've kept as a kind of rule. That seems to be characteristic within the manifestoes themselves,—that you offer options—its almost like you say, "Consider these options". Is that part of your intention?

RV I am using a method, which is called comparative analysis. When you're trying to explain something and you also explain what its not that helps you understand what it is. It's a simple fact. So I think by having those contradictions—I am really saying that one of them is right and one of them is wrong. I am not saying that you're setting up a dynamic, but that I have learned that the one that is right, more flexible, tolerant and accommodating than the one that is wrong.

DSB Perhaps not so much being wrong, but being inflexible.

RV On the other hand it is wrong. You have to say something like that.

Do you have a use of computers as a medium? If so, what was the experience.

RV I absolutely, for myself, do not use computers. I'd like the time to sit down and learn. We use CAD. We use it a lot but I am not a person who does a lot of it that way.

DSB Most of our presentations are done by computer.

RV There's hardly a T square or triangle in the place.

DSB And now we've got the computer tied into a colour Xerox printer. We are able to produce alternative perspective on the basis of that one we've done there using the colours Xerox and our computer that is, using the computer to change one vocabulary to the other.

RV Perhaps you could say, it adds more detail and facilitates a change in vocabulary.

DSB I think we should show the POH facade as it developed.

RV This is an orchestra hall which we designed for Philadelphia Symphony thinking it would go ahead. We have been working on it a lot for about 4-8 years. We enjoyed saying two things that were significant at the beginning. One is, that it is not like the Sydney Opera

House, which was an extreme of a typical situation where these halls were generally put at the edge of town, not of the existing fabric of the dense fabric of the early city. So it is a building that is kind of sculptural to be seen at a distance and where the immediate detail doesn't matter too much. Ours is right down in the centre of the Philadelphia community in the grid system of William Penn that was set up here. The buildings are in dense civic space and they really make space by directing space around the main avenues.

The second part of it was, (besides the location that puts it in a non sculptural situation) is the fact that it was an extremely low budget. We loved saying, "You have given us a low budget and we're going to be realistic from the beginning." Dallas Hall came in maybe 70 million over budget. The hall in the city came in about 1000% over the original budget. Since then, a building in Los Angeles came in 50 million dollars over budget, so we said, "We are not going to do that."

We did do that and then everyone really hated it because it was so banal. They didn't appreciate it. The second thing that happened, is that we designed a building that looks essentially like a brick box with a little bit of ornamentation. We designed it to be contextually correct with its surroundings. Its a building that at night, you read the activity along the facade. Its a building that has a combination of big scale and little scale, but it is really kind of a Quaker meeting house in Philadelphia.

Later we did further studies where the brick became darker. And then what happened was, they said, "Well you can spend a couple more million dollars for the facade. We'll let you do that." and, number two is, "The south wall street you see on this one has now become called the *Avenue of Arts*." There trying to make it a very gala place, in which this would be one of the important contributors, and a night place out with theatres on it and all that. And therefore, since it became a night place, we said "Okay, we'd better make it explicitly a building that reads well at night." So at the very beginning it has a kind of hype, if you will. So at the very beginning we said, "Lets just take that one and I just put all the colour pieces of paper on it because, we would show that it was made symbolically for the Avenue of Arts. It will be two million dollars more.

We had to use the windows and the people as part of the decoration because it was all we had, so we knew from the start we wanted to let light and you see the people waiting and doing intermission here and they would be part of the decoration on Broad Street. And the other things, this was an impression of a new kind of quality. It hadn't yet become a formal pattern. The colour was suggesting Bob's new way of treating this building to make it more gala to make it part of the Avenue of the Arts. But he hadn't found a form for that yet. Now at the same time he was working on this building here, the

Bart. In this situation where the addition has be on a side and the addition is big, and the building is small and modest, and Bob decided to use contrast, not analogy, in the composition, so here is one of the rules of contrasting with this building.

RV A more complex rhythm than the simple rhythm can be seen.

DSB Yes, and so the colour is a kind of analysis of this colour. Its the yellow to white that this is made of but separated out, and its aluminium and glass with brick on the front. So here again, is one of these decorations and now here's Bob trying all sorts of different ways of doing that. He begins to realise that there's another game that you can play here. You're using a Meisian vocabulary, but you aren't really and now with this "Kindart" material, which is porcelain based aluminium—you can get different colours on each panel. So with this kind of material you can begin to make a flat surface with windows, as well as a columnar metal and glass frame that goes from one to the other, across the facade. That already has been into take a new vocabulary of metal and glass and use it for symbolic and representational emphasis. So it's a screen with a picture on it.

He had worked this through a few months before and then as we began to think about this building and its needs now in the Avenue of the Arts, and the concept was, this building must also look good during the day. If you designed it only for night. So we began to think again that you can use metal in such a way that it can have a colour during the day, but at night it can shine and give out colour.

RV This Meisian way is only on the front, its still a brick box on the back.

DSB That's one of our rules again. The repeated facade is a rule.

RV That in a way, that is an earlier version of this facade. They both show the juxtaposition of layers that you see at night.

DSB So there is the front layer with all its tricks of two and three perspective and symbols and then behind it there are several other layers.

RV It was fun about this is of course the colour. We have a museum in Philadelphia, which is a very classical Greek building, which has all sorts of colour, which was built in the twenties when the archaeologists were discovering that the Greek temples were highly coloured. This just follows that tradition and we use colour.

The second thing is that we combined in this, real glass, this transparent glass and spangled glass, which is a glass which was ambiguous in the day, whether its real glass or not. We have ornament of this sort, which doesn't really mean much in the day, but is fun, and then we have this which is something Mies which we would not do, which does suggest the classical big scale quality of civic buildings.

DSB There is in fact, a classical pediment right next to it on a very

famous art school in Philadelphia.

RV **Bendix, down the road.

DSB Yes.

RV So then what happens, at night the building become something very different where these now suddenly become opaque, and these become brilliantly lit and then these become somewhat like cables of a Doric building, with stained glass here, so that it might be a building become something different and it does become more explicitly kind of —it does have symbolism of suggestion abstract, symbol of abstraction of a classical facade, so that it is different night and day.

The building in Sydney is very old fashioned—at night you light the services, you're imitating the sun. You doing essentially what the Greeks did, but they couldn't do it at night, but they made sort of reflect light. These are not that way, these do not reflect light. The light that you see on this building derives and shines from the outside of the building, it becomes a lantern and glows.

The other thing is that there are several scales. In large strict modern condition have only one scale: medium scale. This has the big scale and small scale. It also combines—like in a graphic elements, it has moving imagery along the bottom, so that when you walk on the side walk, the building is not boring. And it gives you all sorts of information—concerning the cultural events on the Avenue of the arts when they do new recordings of the Philadelphia Orchestra and this could be LED moving stuff. And we have another scale of iconography, which happens to be the right hand of the third movement of opening of the Moonlight Sonata. Then we have also some iconography, colour and it is explicitly a building that is explicitly a building to be read at night. It doesn't at night just sort of have some lights on it to make it look like what it looks like in the day.

DSB And there's something else. It still has a set of rhythms, which are quite counterpoint—and here's a Miesian rhythm going through it absolutely evenly. And then within that there are all these sub rhythms, as well as the pediment so there's a—you could say it's a three part fugue.

RV There is a juxtaposition of different orders. This is an order with these things symmetrical—Doric, again Greek columns—its got another column in the middle, which is breaking the rules. But we love the fact that there is a juxtaposition of this rhythm and then the other one, which is a juxtaposition of the rhythm that is made up of the iconographic symbolic element.

So this is again setting up a vocabulary and breaking it. Abusing Mies by putting colour on. He would not be caught dead using colour. It's using Mies and juxtaposing traditional rhythms that are Miesian even but also not even. That earlier version was one where the rhythm was relatively consistent.

Iconography—We found in the facade of the Paris opera that there are 38 statues in front of the facade. There's a whole lot of bar relief there are about 12 niches with busts in them of composers with all sorts of emblematic signs. This idea of iconography on a building is just an old one, that was just thrown out in our century. They sort of forgot that it exists. And if you were a Parisian of the moment you can see that's very Berlioz, that's Beethoven that's a Goddess of culture or whatever is on the facades.

These were the plans which were very complex. The whole interior is another story. [demonstrates layers on plans] This is the ground level where you come in as you do usually in opera houses or concert houses in Europe. Then you go up to the main floor and when you're up on the main floor, you have these different facades. We like this idea of layering.

[Later—Looking at the a chair designed by Venturi Scott Brown]

DSB And then this front which is easy to do as a fret saw is decorated as a symbol. This is a symbol of Queen Anne chair and then its got an applied pattern and that pattern itself is two overlaid patterns, two overlaid metaphors if you like.

[Resumed after break]

If you are very well educated, you allow yourself occasionally to make a mistake in your grammar or how you talk, to make it more effective. You have such confidence in yourself that, you don't have to worry about making this mistake, because its consciously done. Some architects have indicated they have a real problem with that, because they are a little bit of mixed up. There's a little bit of that problem I think it was old fashioned modernists—we are not post-modernists by the way. They don't really have much knowledge of history and symbolism and they are afraid of a making mistakes because they're exposing their ignorance—its all rather complicated. The aristocrat is, somebody who doesn't have to dress exactly perfectly because he knows how to dress perfectly and he doesn't have to do. These are kind of snobbish—not a very pleasant kind of analogies, but its an interesting idea.

It seems that the people that have identifiable grammars often are most prolific. They make a lot of work.

DSB But then someone may look like pot boilers because they use the same grammar all the time.

Its like the novice. If someone hasn't worked out the rules. They aren't quite sure and they're always having to make decision in a difficult sort of way. But once you have a conscious idea of where you're coming from and you start to be aware of your rules.

That's right. Just so you can break them. That's very interesting. And

what Denise said about her mother's house is interesting—that took me four years to design it. I was a young architect, didn't have much work and my mother wasn't pay me anyhow.

In some way we have lived off that. We started with that architectural theme. That is helpful. Well of course that can become the opposite. It can become something that keeps you from evolving. So it can be like you don't break a rule or you develop. Anything really good can become bad really.

It's such an irony that in language—the reason that we could get rid of the grammar idea was because we embraced abstraction so much. I mentioned mention Michelangelo; or Shakespeare produced the language of the time. Genius doesn't come from inventing particularly a new grammar or vocabulary, which we are using all the time.

Would you agree with the idea that design is computation?

I think there has to be another way of saying it: there has to be order somewhere. Now the order can be dealt with in terms of making it an impure order or an order with a lot of exceptions, but there has to be order. And then the question: Is there an overall order that you use for all your life, you know the whole community uses, or is there an accepted order? In the same building in a way, we have different orders. We're saying you set up an order. We're not being universalists or we not being Richard Meier, the architect doing lots of things in the same way. Its easier to get jobs when people get into that.

DSB But we do look for kind of a conventional way to build and try to use that when we were building in Bagdad, we looked around to see how most modern buildings there were done, which was with brick and concrete. Used that as our basic vocabulary for the shed part of the building and then added ingeniously decorated facades, using the concrete casting technique that they used, and like those chairs—getting complex patterns in one dimension only, in the casting and then in other places using the tiles which again they had used before. So we tried to use conventional methods and yet still produce fantasy, but fantasy in one dimension only.

RV Denise, what you're saying about convention is something that we should have mentioned at the beginning: that convention connects with grammar.

DSB Because it has rules.

RV Convention is something we are not afraid of—we like it, we embrace it. And that's something again that made modernists more conventional is—the ordinary, we love the ordinary, we make the ordinary extraordinary. We learn a lot from Pop artists who did the Campbell soup can and gave it another context and another scale and it became extra ordinary. So convention again we love looking out of a window of a train or a car and we just learn all the time from the every day. I think that is different from the heroic stance of,

as we were saying, I don't learn from the ordinary I despise the ordinary—my job is to be extra ordinary. I think that is true, good art is extraordinary, but it can derived from the ordinary. There is a long tradition of that.

DSB If you are travelling in Europe or the Middle East and you see a hill town and there's a—it's almost like a crystalline order in that time and a lot of that will come from the spanning ability of wood because the buildings can't be bigger than their immediate rafters. So that the order comes from the technology that was available at the time from building the infrastructure, building the tissue within the town. Now when you go to Tokyo, you sense that same order almost as if its constrained by that dimension of wood, even today. Then you find that what it is, is not the dimension of wood any more, but the property ownerships that grew up around that. That even when they rebuilt in the 1950s after being decimated, the property lines still existed and you get these amazing eel and pencil buildings which are about 10 feet wide and 10 stories tall and it comes from the ability of wood to span 10 feet is a bit much, but even 15 feet wide—but that's what they have and then the building goes up as high as the one really needs to be. And you can again, sense that order from the town which came from a technological constraint.

A pattern of rules emerged.

Yes, and it's the same way technology of defence gave you a huge ordering system and the mastiffs and the walls and the technology of the automobile does it in the present city. It really dictates the rules of the form that you can make.

Is there a special aesthetic, or style for want of a better word, that you automatically arrive at somehow?

In a way, it can be on an unconscious level.

Does it become second nature and that's just the way the decisions are made because they are there? Is it that, the way you feel about it?

RV No. I feel sure that must be a continuing themes or methods that you go through and you evolve. It is like it relates to your character. You have a certain character or personality trait. There's also the intuition—of getting somewhere by intuition as well as rationality in thinking. I think that it is true that a person has a personality that is more or less consistent and just goes on even though there are changes as you get older.

DSB In my terms, I think having a whole lot of interests and ideas and concerns, gives you a rich mind which you can then bring to design. You've got lots of vocabulary, lots of repertoires, lots of things you've seen, lots of ideas in your mind which might be non-physical as well as physical. You bring all of that. But then, at a certain point you have a problem and your problem has strong con-

straints, thank God. You really had to organise this particular use within those constraints, which come from the context and from the program and things like that and that gives you a structure and all these other things come in at a less than conscious level. You might jump at a solution, as suddenly it's there. Then in retrospect you can say, "Well now I see that it connect to that building there, that I was working on at the time and I've seen such and such when I went to Bavaria and I always love such and such." You can *a posteriori* see all these influences. But at the time you have just your rich mind and the whole thing going around in your head as if your head's a computer and making fixes and coming to points of conclusion, dealing much more of the problem itself. Getting up and doing a hard days work every day, trying to solve a problem, and these other things feed in at a less than conscious level.

How have your philosophies merged during the partnership?

He had a set of experiences and I had a set of experiences, which meant, when we met, we had a lot to say to each other—more than anyone else around us and it was surprising, because everyone said "Well Bob's an architect—he isn't an urbanist at all". And I found people they called urban architects very dull and the concerns that I had coming from Africa via the AA with this kind of "eyes that will not see", philosophy and interest and social questions and in large issues, as well as love of detailing and architecture—he was the only one in architecture who understood that mix. Now there are a lot of people in the planning program, who I felt sympathetic with, because it was the time of the urban uprisings and they were all very involved with social planning and my feeling is, I am a functionalist and I include social functions and that for among other things, aesthetic reasons, because those functions free my eye—they jolt me out of the ruts that help me find new forms and new vocabularies, So forth, inter alia I want to deal very head on with my problem. The way we embrace the fact that there was a low budget in this project. We said we would make something even better, because the set amount. So hard problems make an agonise architecture, which is much stronger and its the only kind we're interested in. Well Bob and I both felt that. He loved the way I look at the ugliest parts of Philadelphia that he'd grown up hating and suddenly saw them with different eyes. I was the one who invited him to Las Vegas when I had gone out west. I went west because I was invited to teach at the University of California and I went because I'd been taught at Penn and Planning school that southern urbanism was not to be scorned, but was to be understood and I have learnt from planning school, the notion that chaos may be an order that we haven't yet understood. So there were all of these ways of thinking, in which he was very sympathetic.

Bob's mother was a socialist and a pacifist and he understood the upheavals that I was eager to embrace as an African in America. So

we had sympathy on many different levels. I'd lived in Italy and so had he. He's Italian American, but I am the one who speaks more Italian. So, there's many levels on which we can operate. We both—Europe can be very important as part of our development.

What's the most recent derivation that you might identify—a set of rules that seem to be emerging..

I think we must have showed this one.

Right, so that's as far as it goes at the present date.

Except, I think if you look at the Oberlin building, which is made up of a checkerboard of tiles, that's part of the heritage which leads in this direction. It's kind of a hard edged side and then a kind of shingle cottages and buildings of that sort, are soft edged, but they're not really. They're really just as hard edged, but in a different vocabulary and they overlap in a way. They all have an interest in scale juxtaposition of scales. Big scales—big building with ways of organising the scale to show the form—from small to big. Little buildings with very big scales. Buildings which are not complete in themselves but need part of the environment to complete themselves. These are all ways in which they overlap, even though there are some that are using softer, more romantic forms than the other.

Does that relate to the idea of "Viva virtual architecture, almost"? Is virtuality a key concept that you're including in current work?

RV I think really all that relates to is something that I am suggesting, but not knowing much about, which is that we are now able to by a scenography that is electronic technology in which the effects are not real, that are not physical,—but that can suggest physicality. And that's a huge subject that I almost want someone else to do it. I just feel like saying, "I am identifying this difficulty" and people from the beginning do have, you know people carry on and do it. So I think the "virtual" is just saying that, "Let's not emphasise all this honesty stuff". No art is particularly honest in a sense. One definition of art is to say: you're thinking something to look the way it really is and also different from the way it really is. Its more a part of art to give it extraordinary aspects.

I think of *virtual* differently, it just isn't really virtual reality in the conventionally accepted sense. It might connect with part of the environment in a very special way. For example, it reminds how it happens when we went go into a church in Ravenna. You are in another magical world of golden tesserae and the reflection of light and you're taken into a magic realm We can do that magic by other means that we call virtual reality.

DSB There's another way of seeing which is that, we are interested in representation on a very fine surface and if you think back to Art Deco architecture, they had bar relief friezes. The miracle of them is,

they have layers behind layers behind layers and the whole things is less than a half and inch of stone. And yet when we began to think about the decoration, we were working with, that was still too thick. We began to look at Art Deco posters: McKnight Kauffer, or someone like that became very important, because he did the whole thing on a flat surface, which you then plaster on the building. So our representation was plastered on the building—may be an eighth of an inch thick. Now we're saying that with the representation flattened, it can suggest layers, but it's very flat.

Now Bob's taken one step further. The virtual is just a light surface on the building. And yet as we produce this, which is meant to be very thin, it suggests depth, it suggests layers behind layers—all with a notion of the thinness and lightness of something that his modern and industrial. So I think when he said *virtual* was thinking the ultimate thinness and no dimension at all.

RV The word *virtual*—its intention is used by similar nouns as a representation of similar ideas. In the sense that the difference between the post modernists and us is that we're very careful that when there is reference, there is symbolic and decorative historical reference. There is no ambiguity, no imitation, not the real thing and when we use Mies its an applique. It's not a real classical applique, it is an ambiguous suggestion of an applique. [claps hands for emphasis]

How much do you speak in terms of metaphors when you're planning and designing?

RV A lot.

DSB I remember when I first started to actually work. My father and I talked together and I would go into his office to give a crits and then we co-operated on a scheme very early on before we both met Penn and it was a fountain. I remember Bob saying, "We could make this like an Edwardian lady's feather hat", and my feeling is these are heuristics. We often say, "This is a terrible idea, but", and then out comes something like that. These are metaphors that help creative people to find form and they can come from all over.

RV Metaphors are very important.

DSB There was a time at the National Gallery where we kept on using metaphors and our client got madder and madder. Finally they wanted the back to have decoration on it and I said to Simon Sainsbury, "Simon, it's like your suit." He had suits made at, (what was the name of that place that), Huntsman in Saville Row,—beautiful suits, but there was lapels on the front, but at the back it's just beautifully cut and very simple and plain. And he said "Denise, I don't want to hear any more metaphors from you!". But, clothing metaphors have a lot of scope.

Thankyou.

David Walker: Interview by Dean Bruton

Design Discipline, Faculty of Technology, Open University, Milton Keynes

1 July 1996

Revised by DW

2 October 1996

David Walker is Professor of Design at the Open University and editor of the journal *Codesign*.]

I am interested in derivation sequence according to rules in the work of grammarians. Your work is of interest, both as an architect interest and as a design educator. Can you think of artists or architects who appear to work with fairly strict rules?

I know the work of Tom Phillips the artist, pretty well. I used to know him when I lived in London in the sixties and I liked his work a lot. I liked the fact that he used for some of his works kind of rule generated systems. He used large zinc stencils of letter forms. Each size of letter would have a notional colour. He would draw them out on a canvas and only where another letter overlapped would they appear in paint—so they have this fragmented slightly transparent appearance. When they were complete they were very big paintings. One or two of them were bought by the Tate. They captured the kind of feeling of late Impressionists, like Monet, which was rather strange because they start from completely mechanical forms. So I guess my knowledge and interest in that sort of rule oriented art started there.

I am interested in the work of Peter Eisenman and some of the New York Five architects. Eisenmann's work has become very cerebral and disconnected from any real utility. He did that strange piece for Comme les Garçons .He takes the fan like forms which were the patterns for garments. Then he manipulated them through a computer, finally making a grid that became a screen in the reception place of the Comme les Garçons fashion house. I feel ambivalent about because it is another architects game.

I think it's frivolous because it's disconnected from some kind of program, a program about how people might want to use spaces. It is simply an aesthetic object put in the foyer that people have to walk around, avoid and duck and so on.

I am interested in the contingent sense of grammar, contingency, in the sense that it adds to practice and understanding, as well as the idea of contingency as situational, that is, when rules appear to be used, when they change, when there seems to be a sudden change in a derivation, how much rules appear

to carry over from one work to another. Can you see a value in that idea, ie a contingent sense of grammar?

Yes, of course, a grammar is part of a language and the function of a grammar is to communicate intelligibly. So the point of having these things beneath art and architecture, that is an infrastructure, is in order that people can read them, so they are intelligible in some direct way. You might have a grammar that you hold on to as a producer but if people aren't with you , if they don't share at least the main outlines of that grammar, then they don't really understand what you are doing. So the contingent, or contextual, sense of what you are doing derives from a shared language and whether other people are aware or educated to a similar level as you are as a producer . If they're not, then what you are producing is meaningless and empty. I think one of the dangers of the grammars or the language that artists, architects and designers employ is that it becomes so idiosyncratic that no-one else understands it. It may actually be quite legitimate within its own terms ,but they're like academics that have moved up the mountain top, have reached the peak and there is no-one to talk to. That's a common phenomena in lots of high level research but I think art and architecture should be socially connected. They have to have an audience.

Could you talk about an example of your work in these kinds of terms, in terms of derivation or rules.

Derivation of rules? I've done one or two small exercises that are really about setting up a situation and then letting it flow according to the rules ,like this Magic Suburb. This was a notion that you could have a set of semi-detached houses along a notional street and each of the houses could in this fantasy be designed by an eminent architect. So you start with the standard semi-detached house of the mid 30's and then you can move along the street and next door is a version of that house designed by Adolph Loos, next door to that is a semi -d designed by Peter Behrens then a version designed by Gropius and then Le Corbusier and so on. In this drawing there was a modulation and a historic synopsis of modern architecture as if in a single suburb. Hence Magic Suburb!

I think the idea was derived from going to see some of the classic estates of the modern movement around Vienna. You actually get something that's a bit like that there anyway As exhibition schemes, there are these amazing architects each producing one row of houses. So the Magic Suburb idea applied this to, as it were, a standard suburb. It was on a grid with all these fantasy semi -d houses just dropped into place.

How did you come to, say Adolph Loos' form? I mean what were the rules? Did you ever think about rules that created the form for that particular example of house?

Yes, because you do it by looking at the Adolph Loos houses of a certain period and they actually change. If you read his writing about how he's planning them and how they appear on the elevation, they seem to me to be very rule orientated anyway . There is this gradual evolution from the very early houses like the Steiner house. They tend to be symmetrical, they tend to have windows on the edges, the pattern of windows unlike all the predecessor buildings is generated from the inside, the buildings are white an without ornament. So there are unconventional conventions that he has made for himself. Then other people took them up. Loos was the first person before Le Corbusier to have rules of those kinds..the Modern Movement rules.

Where there times when the way a form was developing in your work seemed to change markedly, perhaps you need another example here where there is a sudden change in derivation and I was wondering if you could identify a rule change that caused that change of derivation.

The only thing that comes into my mind is one of the recent projects I did was a studio for myself down the bottom of my garden. The new rule, which is a very general rule that I adopted then was to use as much material that was recycled as possible. This leads you off into scavenging for building materials , bits of factory and Victorian doors that you'd cut in half and so on. But the aesthetic that comes out of that is really quite strange. You're sort of led by what you find. I quite like it. Then also you then mix that in with modern construction. You don't make it like a pastiche Victorian building because you have come across a Victorian window frame. You still want to say this building is of the 1990s, so you actually you get this quite rich mixture..an architectural collage.

In this case I have a Victorian style door that was truncated. I had a circular factory window that was from the 30s and I was using glass bricks. But all put together to make an elevation that went to make a form that I think integrated quite well. I quite enjoyed doing it. If I'd not had that rule at the beginning it would have been much less surprising. Of course it's partly an economic rule because it was about going out and getting cheap stuff ,but it was also an ethical rule, because I think more and more buildings should be like that. There is a trade-off between the time you might spend designing and originating things de novo and the time that you might go off scavenging for things. If you like scavenging, if you've got a car boot sale mentality or a jumble sale mentality then it's quite good fun. You don't look on it as professional time that is set against the activity, as a loss. It is more recreational.

Do you ever use computers as a medium for designing, if so, what was the experience?

Well that studio of 1992 was the first time I'd used CAD from the beginning to the end. I am talking as a novice in CAD really. Things

that I found good about it were that once you'd got the images loaded into the computer your powers of manipulation are just so huge. You can repeat things. You benefit from the accuracy of them and the fact that all these things can be dimensioned is just extraordinary. Although I was using a very crude clunky sort of program that people told me later I shouldn't be using at all. It is called MacDraft, is an engineering program really. So that's the main benefit of it. For your work and the work for people in your field then the universe of possibilities and your powers of manipulation are just hugely enlarged .Your scan of possibilities can be so huge. But the downside for me was actually doing the initial work—to construct the images. This meant drawing with a mouse very often and that was just a real pain. Maybe that was just symptom of my own incompetence really. They should have been scanned in or I should have had a drawing tablet. I should have had a more sophisticated means of putting them in. But once you've got them in then you can take off.

Do you agree with the slogan that design is computation?

No.

Why not?

Because computation leaves out the element of human skill. It makes it sound as if you have the right algorithms and the right starting points you will get a good result, that is a good result according to your starting criteria, a good result in its aesthetic, a good result in that it is appropriate to the users or its not going to fall down structurally and so on. I don't think that is true.

If I said to you "Do you believe that good tennis playing is computational?" then you'd say "No". But why do you say "No", Well, because tennis playing is a human skill which is kinesthetic and depends upon responses between eye, hand and brain. I don't actually see tennis as very much different from design. Your responses might be a lot faster in tennis because you've got to make up your mind about what you're doing in milliseconds. Maybe the process is slowed down in design but this cycling between an image or model that you are generating, how you perceive it ,then what you do next physically, and how you re-perceive it, I think all that is pretty similar to tennis , because I think most human skills typing ,playing the piano, are actually of that kind.

How do you distinguish art from design?

In art you are a free agent more or less- given that you have a sufficient amount of money to spend on a material or a medium. Let us say you're Van Gogh in the attic. You need paint and canvas, legs and the landscape. You need a certain health and economic life to support what you're doing, but that's the only constraint. Artists can make art out of almost nothing. They might be compelled to be minimalists because they can not afford very much material. They make

it according to rules that they think about and derive experimentally. They're experimental by nature and they make discoveries which are personally significant. What other people think of their art, to a genuine artist, is more or less irrelevant. I think that is quite right, why should it be relevant. They are working on problems that they set for themselves.

The position with design is quite different because the problems are set by other people. More than that the criteria are mostly, if not entirely set by other people. If you're a designer that acts professionally you know that from the beginning. You work in the service of others.

If designers think they are artists then they are going to be bad designers. Because they spill over into making objects and devices that are really just for their own satisfaction, your a good chess player at playing the game but screw everyone else. I think that is a really bad attitude for a designer/architect.

The unfortunate thing is that fine art has come to act as a corrupting force on design, particularly on students of design who are being educated in parallel streams with fine artists, because they see what fun they are having and how unconstrained they are and it is very seductive. They want to be like that too. They want to be the protogenius. I think that is very damaging. They have to be told the constraints, the parameters and structures, as offered by other people , are not damaging. They will still allow them to be creative and to do exciting things and to do things which are good works. It will make them tougher better designers. Their ideas are work hardened. They've got to get used to the idea that they don't operate in a world of unlimited freedoms, whereas I think fine artists do.

Can you think of a work of design that you would also say was a work of art?

I think most good works of design have a transcendent quality and that's what makes them a work of art. Sometimes people arrive at it unconsciously without really focusing on that as an ambition "I want to make a great work of art". I don't think really good fine artists have that as an ambition. I don't think that when Matisse or Cézanne are painting a bowl of apples they are thinking to themselves "I've really got to make this a great work of art". I think that is a nonsensical puerile idea. I think what they say to themselves is: "I really want to capture something that which is essential about this apple visually. I am so obsessive about how that apple appears and if only if could struggle with this medium and reveal it. That is the task I have set myself". Out of that process and enormous curiosity arises a by-product which in their hands is a great work of art.

Students and novices in fine art and in design make a huge error when they say, "I want to make a great work", and that it is almost

inevitable that they won't. The great work will come out of some other kind of ambition. The ambition in fine art can be a kind I have described with Cézanne. But in architecture or design it might be just something prosaic "I want to make a building that will really fulfil these functions very well" and maybe it'll be surprising as well,

Denis Lasdun said you should give people what they want when you design buildings for them ... but you also give them something that they don't expect ... it goes beyond their expectations.

Well, how could you describe the rules for transcendence?

I don't think I can. It is as if you are asking "Here is a person of extraordinary high level skills, how does he arrive at those high level skills and can you write them down on a piece of paper for me?" So I say "No I can't".

But that does not mean to say they do not exist. They are embodied and demonstrated in skilled practice. If we use the tennis player as an analogy, you say well I've been coached to do everything that McEnroe or Seles does but I am still unable to achieve that level of performance. I know what to do but I am unable to achieve it. Now I think your interest in philosophy will take you somewhere into that. The distinction is between two sorts of knowing, two sorts of epistemology if you like: one is "I know that", or "I know how". This is the distinction that Gilbert Ryle wrote about in his book *The Concept of Mind*. It is a very common distinction in philosophy. It runs back through Russell who wrote about knowledge by acquaintance, which means you know it through your fingertips: or knowledge by description, which you know in a indirect sort of way.

I think that is a very powerful distinction in design. You know how because you have actually rehearsed and re-iterated these things so often that it becomes something that is quasi-instinctual. Psychologists use the expression *acquired instincts* which is odd. But if you're a piano player or a typist your responses during that active performance is absolutely unthinking. BUT you can only get there through lots of kind of dull stuff like practice and rehearsal, mistakes and iterations. Then the knowledge is wired into you.

Now the slightly unsatisfying thing for an educator about that is to say, "Do people really have to go through all that in order to acquire know-how?" I think the answer is, "Yes they do".

The other unsatisfying thing about it is you can not actually extract that component of know-how from them and deliver it intact to someone else. It is locked into that person and it is locked into that set of activities. Even if you say to that person, write it down, or just tell me what you did, give me the algorithms, give me the rules and you hand it to someone else. There's absolutely no guarantee that they are going to become highly proficient performers. They might get better a bit because they say, *"Oh now I see, I understand. I know*

that ...". In this way they might get better ,like they might get better if they got a really good coach in tennis.

So if you say, "Can I give you the rules for the transcendent object?" I think the answer is "No, I can't". Because it is transcendent, it's very nearly uncapturable. It exists in its own domain. Most language that tries to deal with it, certainly verbal language, falls miserably short of being able to say much about it. Even the most mathematical language or algorithmic type language would have a similar kind of cut-off point. You can only say rudimentary or trivial things. What is left is unsayable.

My philosophical position is that I am a follower of Wittgenstein. He said that there are certain things that you cannot speak of therefore you pass over them in silence. He wasn't saying they are irretrievably trivial or nonsensical or a great cloud of mysticism. He was saying that they exist , they can be witnessed and they can be demonstrated in different ways. They are visible and embodied in the world but language has a fairly low cut-off point.

I believe he is absolutely right. I think the people who followed him in philosophy like the Vienna Circle and people in the English school that associated with A J Ayer, they were fundamentally mistaken because they said the limits of language are the same as the limits of the world. If you say alternatively the limits of the language are actually mapping only a tiny part of the world then for me that's a much more accurate portrayal.

I think Wittgenstein believed that because in his private correspondence he said things like *"I map the island in order to show the limit of the ocean"* The ocean is the important thing; the ocean being the transcendent, the higher level skills, religious feelings, holistic feelings about the way the world works. All of which are more or less imponderable or certainly very difficult to capture in any language. But this doesn't mean to say that they are unimportant. I think they are hugely important. They're more important than all the things that language can say. They transcend language.

How do you see the place of shape grammars and the grammatical approach to design within art/design education?

I think its part of a general movement to make things explicit which I entirely approve of. This may seem to contradict my previous remarks but while I think that there are a lot of things that can not be said, but this doesn't mean to say you avoid saying the things that can be said as clearly as you can. In design education there is a serious weakness at the centre. I am thinking of mainly of graphics, fashion, product design, all the softer areas of design but I believe the same is true of architectural education. The huge weakness is that the processes that students and practitioners go through is not explicit. Therefore it can't be examined, therefore it can't be replicat-

ed. So it presents a conundrum if you go to a design degree show of student work, as we are having in Britain at this period in our summer. You ask students, "Where do these ideas come from, what was the trigger for them, what kind of transformational processes assisted, did they go through?". They can't tell you. It's both because they don't want to tell you and because they're not very scrupulous in actually recording those processes. For them it has to be mysterious and I think that is quite wrong and I sort of resent it.

The second thing that follows from that they produce a work it's just about the object itself on the wall, or the design or the model or whatever it is. No-one else can take away a chunk of that material and say "I'll develop that further". The real weakness of design education is that there is no culture of collective knowledge building. It's a completely foreign idea to build knowledge. Every piece of work could be a little brick in the wall and that gradually you would get this large splendid structure which was about what the people in design knew ... but they don't know anything.

In a sense you mean the black box culture of design, but the methodologists thought that they solved a lot of the generic problems?

I don't think they did. If you look at the work that of the design methodologists in the 60s and the 70s I think they thought they wanted to make those things explicit. But they were very bad about deriving the right kind of language from what practitioners did. Even something that seems outwardly sensible like: "There is a phase of analysis that leads to a phase of synthesis", that sort of thing sounds convincing, but it is not when you examine it.

It's not very convincing because if you are designing or making something and someone takes a hold of you by the shirt collar and says "Are you analysing or are you synthesising?", and you say, "Oh, I am actually doing both", because there's kind of an oscillation that is quite rapid.

I don't use that kind of language as a practitioner or teacher. Instead I say "I am kind of pulling things apart and putting them together again. "Why are you doing that?", you might say, well, "To see what happens",—and when I see what happens I know what to do next. To use the Donald Schön expression: *"The material talks back to you and tells you what to do next".*

I think that portrayal of the design process is much better than anything that any of the design methodologists wrote. They are still continuing to write things that I think are mistaken. Gabriella Goldschmidt is working on this idea of the design process being a series of step connected steps. But I think that all she is doing is talking about the system that she set up to examine the thing, rather than talk about the thing itself. So all that you get is a picture of the

language net, you don't get a picture of the fish. You don't catch the fish. You just pull in the empty net.

I'd like to ask you about Chomsky's work on natural language and grammars and whether you think that that maps onto visual language.

I am not sure what I think about Chomsky. Do I believe that there are innate structures of language within human beings that allow them to manufacture a variant, what we call French, German, English or whatever? I don't know if I believe that.

But do you think that the atomistic approach, the structuralist approach can be used profitability by visual practitioners and for visual language?

Yes.

Do you see then that shape grammars have something to offer?

Sure because of the reason I said—they are one part of the ways of making some of these processes explicit. But there will always be people that don't want to operate in that kind of way and I don't think they're illegitimate., They will always say "I derive my forms, I think about design in another kind of way, and I am not really sure if I can tell you how I do it. I have no algorithms"

One of the difficulties that I have about shape grammars and rule oriented design is that I can see that almost all design has to respond to constraints, but that isn't the same as responding to rules. If I make a distinction between a constraint and a rule it would be something like: *I've got to design a pen, and it's got to be manufactured for 50 pence.* This is a constraint but it's not a rule, because a rule isn't actually directing you to any procedure. How I proceed is left open within the field.

Are there any other artists work that you think is particularly grammatical, that is it relates to the ideas of rules and derivation?

I think there are some artists that are very obviously working with rules and that's apparent on the surface. But many artists work with rules in one way or another. If you look at someone like Carl Andre there is obviously algorithmic type operations going on in what he produces, but I would say the same is true of someone seemingly unsystematic like Pollock or Lichenstein.

There must be something going on. If you were to examine the identity of the work from the other direction as an observer you look at a Lichenstein or Pollock and you identify something as their work. Therefore there must be a kind of formal vocabulary that you associate with them. So behind them there must be some formal infrastructure and operations that they are using that in turn gives them identity.

Is it possible that you can have artists that don't do that at all? Are there any artists that don't?

I think there are, because there are people that don't really care what the rules are. Sometimes they are experimenting or originating too many rules so the work becomes clouded, inconsistent and incoherent.

I also think the characteristic of a good work of art is that it sets up a system of rules and then subverts them in a way that is quite unsettling. Then it is later revealed as consistent in some more subtle order. It's like another nest of rules that you wouldn't have expected. Bad art is often too predictable: rules mechanically worked through without struggle or surprise. By contrast think of someone like Francis Bacon. If you look at his paintings, you perceive a struggle going there looking for the right language. He is trying to discover his language that is his unique way of expressing himself.

The problem with rules is that they sound a little bit too severe, and a little bit too rational, sequential. Whereas in fact the method of working for a lot of painters, sculptors, fine artists, architects, designers and so on, does not feel like that. They may be half consciously searching and deriving rules for themselves but the rule may not be explicit, nor exact, nor can it be replicated beyond the work. There is no fuzziness in a rule , but there is a lot of necessary fuzziness of work in progress, and that is the problem.

Thankyou.

Robert Woodbury: Interview by Dean Bruton

Department of Architecture, Landscape Architecture and Urban Design, University of Adelaide,

27 September 1996

Robert Woodbury lectures at the School of Architecture, University of Adelaide. He developed *DiscoverForm* with Christopher Carlson and is working on solid model interpreters for architecture.

Your work is relevant because you have written a article on grammatical hermeneutics, could you explain your position and how it relates to your understanding of grammars in general?

You might say that the term grammatical hermeneutics perhaps has no currency because it was made up out of whole cloth in response to interaction and discussion with Richard Coyne and Adrian Snodgrass. You could take it as several things.

You could take it as an initial exploration of their ideas in my terms, grammatical terms, or you could take it as a bit of a tongue-in-cheek response to their, then style of debate which is to have a straw man and knock it down. I was simply saying "I am not your straw man".

That article set out to show that grammar is, to use a metaphor, no more than the hammer in Heidegger's hand—that it is simply a device that we use as we use all tools. It reveals some aspects of what we are studying and naturally hides others. So grammar is no more a formal device which in the hands of the aware is no more problematic than a hammer. Certainly the old saying, if you have a hammer in your hand everything looks like a nail, certainly applies to grammar, if you have your head full of grammar, designs tend to look like they have spatial structure. Perhaps for some the meaning of architecture becomes only that spatial structure. That article was really about saying, grammar is a device like all other devices and people who use it can do so in ways that in themselves are not grammatical.

One of things that Richard Coyne said was that he thought that hermeneutical interpretation for grammarians was a fairly shallow operation and it was a mechanistic decision making process. Would you agree with that kind of assessment of grammatical assessment?

I think Richard is being mischievous. Again it is a bit of a straw man argument isn't it? For which grammarians? The spatial grammar system can be looked at as nothing more than something that helps you play with structure and looked at that way it is a bit hard for me to understand Richard's comment.

As you know I am looking at grammars as a means of representing the designs of others in the past but I am less interested in that than in the relation between the concepts of grammars and the process of making designs, especially Schön's idea of the reflective practitioner. Can you comment on the idea of the reflection in action and Schön's ideas in regard to grammars in general and part in particular?

As you well know, I make no claims of being an artist or commentator on art so any comments I make will be contingent at best.

When you discuss process you hit on an aspect of grammar, an aspect of design that is written about a lot and arguably without as much effect as other writings on design. The study of process in the literature is larger in some areas and insightful in some areas, but one of things that studying spatial grammars systems gives you is a fair number of metaphors for thinking about design process. We can mine out of the ideas of formal mathematical systems of grammars notions of derivation, which is simply the designs creative work follows as it leaves the path of ideas behind it as it proceeds.

Somehow looking at that path or having consciousness of that path leads you to particular ways of thinking of what you might do next. It also provides the notion of alternative, being that there are alternative ways to doing anything at any point in a design which leads us to thinking about creating several related schemes in response to a particular design issue. It leads us to thinking about formal structure and regularities in design and trying to re-use structures repeatedly—this is the metaphor of defining and using grammar rules.

So it gives us these metaphors which we can use to think about design process at various levels of formality from very gentle intrusions, if you will, into a "natural design process" where you simply point out that your recreative work is actually a chain of designs which are derived in some way from some transformation of a previous design in that chain and then going back on that chain to a previous point might lead you to re-think and go off in a different direction.

So there is that gentle metaphor of search and exploration that you can begin to bring to even beginning design students. There are metaphors of structure, of looking at regularities in worlds of designs that can enter very early, and this can go anywhere from this very gentle, thinking about the metaphors that grammar generates to quite hard edged thinking about grammar being a device that can actually help you characterise and create in a interesting constructive way, bodies of design work.

Can you give me any examples of artists/architects or designers who appear to work with fairly strict rules?

Of course. It's actually hard to name one that doesn't. If you look at

the playing out of Mario Botta's work, it can be seen as many things, one of which is an exploration of the possibilities of strong sculptural shape with pierced openings—large scale pierced openings. That is a very parsimonious explanation of his work, a partial explanation as well.

But the parsimony comes from it being grammatical, I told you how he makes or a way he might make, one way in which he might make and such an explanation doesn't pre-suppose that we know what he is doing except that it is easy to at least partially apprehend his work by thinking about it as that kind of making. From my own experience of teaching it is very easy to get students to start to play in similar worlds and find their own kind of light in those worlds by thinking about only big blocks, big wholes through the blocks.

You can tell people about that in the beginning and they start to make interesting things almost right away. It was not fair to single Botta out—Calatrava's work is certainly seen with clarity through grammatical lenses as is Tadao Ando's. There are depths in all of these architect's work that grammar doesn't explain nor does it pretend to explain but it does help us come to grips, particularly as we are beginning design learning, with how you might go about making such spatially rigorous and complex things.

I am interested in the contingent sense of grammar when rules appear to be used, when they change, when there seems to be a sudden change in a derivation and how much rules appear to carry over from one work to another. Could you give an example and perhaps explore that idea further in your own work as a grammarian?

Terry Knight has done a brilliant if simple report of that when she noticed that virtually the only change one needs to make from a Prairie School grammar to the Usonian house grammar in Frank Lloyd Wright's work, is a re-orientation of one room—and then suddenly you start generating Usonian house plans. That's an interesting discovery: that one can come to a very parsimonious description of a body of work of a famous architect and can then come to another very parsimonious description of a later body of work and the difference between the two descriptions is one rule. There is, at the very least, an interesting intellectual curiosity there. At the most, one might make a claim this is evidence of some kind of grammatical process going on in people's brains, and that is not a claim that I am particularly comfortable with.

In terms of changing rules from my own work in design, I am primarily a teacher of design—a role that is almost like a coach's. It is one of assisting students to discover their own capabilities. It is a very familiar event for me when a student, in essence, figures out a design puzzle, figures out the pieces that they are using and then from that point in their design work their design transforms from a

figuring out of those pieces to a playing with those pieces and a realising those pieces in different configurations and a refining of those piece. This is often an immense struggle, but it is a very joyful and a very productive struggle to find interesting ways of working with designs. So many of the stronger student projects are the search for their rules that are appropriate for that time and circumstance.

Another person that has written about this quite eloquently, is John Archer, who discusses puzzle making, what architects do when no-one is looking. He describes architecture as a discovery of a puzzle and the puzzle comprises the problem and the appropriate set of components to work through the problem in steps and it is that puzzle which is the difficult process. Well if that isn't a grammatical idea, a chain of thought that, grammars throw light onto, I would wonder.

In your own work in the SEED project for example, one of the ideas that Dilthey, Husserl and perhaps Heidegger come up with is that, and I am postulating, that there might be some deeper sense of understanding consciousness of self, of identity, of kind of quests that artists are traditionally involved with. Do you think that might come out of working with grammars? Could you make that kind of claim or perhaps is that going too far.

No more than it comes out of working with any other kind of tool. I think we are in a interesting time right now, when it is becoming clear that the computer tools we have in architecture are beginning to produce different kinds of architecture or beginning to influence the way that kinds of architecture are produced.

Not only because of computing, lots of ecological and societal reasons, we see a greater sense of playfulness, a greater sense of non-orthogonal form making. These are very strong formal elements in architectural design that may or may not be related to an orthogonal grid. You can't argue successfully that computing is the sole reason why those things are happening but likewise it is very difficult to argue that the freedom that computers give us to play with three dimensional form isn't an influence in that. Bill Mitchell talks about Frank Gehry's *Fish*.—I would have thought that alone is a real case in point. That is an object that could not have been built without the devices available through computing. It was utterly designed and fabricated using computer processes.

Computing is a tool, it is relatively straightforward to argue that it is changing way in which we make form. Grammar is just another tool.

How do you see the place of grammars in making new designs, just as a tool? Do you see the loose analogy as being a productive tool as much as the formalist system of grammars or are they the same thing?

Yes. I don't really know what people are talking about when they

talk about the formalist system of grammars. I think they are mixing up two ideas. They are mixing up the heart of this, in order for one of these things to work on a computer computational device there has to be an incredibly crisp, well-defined formal system ticking over. That formal system guarantees that every computation that grammar system is doing is correct, it guarantees that the computations are well formed and they are producing sensible results. I don't think for one minute that implies that we have to use grammars in a formal way which reflects that kind of formal machinery that has got to be ticking over inside a box, if you want some computer support in grammars.

What grammars do is allow you to give a set of form making strategies instead of particular forms and they give you a way to play those things out into a world of alternatives. A properly written grammar system, which almost do not exist today, would allow one to very rapidly change the form making strategies and see the effects that had on the kind of things that can be made.

So the vision that people implementing grammars have (and I am one of a relatively small number around the world, but still one of several) is that we have these devices that give us a freedom to explore possibilities, to explore potential, so with the effort that we work through one thing now and one idea, we might work through large families of related ideas and we might use these systems to discover for ourselves new ways of making.

Perhaps the biggest distinction between grammar systems and things that we presently have in computing devices is that there is an explicit way of representing making with a grammar whereas with existing things we have only explicit ways of representing what we have made.

So the standard CAD system gives us the ability to represent lines or surfaces or solids in some abstract world, and when we are done working we have something made up out of those primitive elements and combinations of these elements. If we are extremely lucky or smart or have lots of money we have some computer programs that will do fragments of this for us. For example, in a familiar add on packages that one buys in CAD systems that do things like stairs and roof details, all is hidden inside a little piece of completely uninterpretable, un-decipherable computer code, whereas grammars bring that to the surface. They give us ways of making, where we can now interact and work with not just the things we make but directly with how we make them.

Given that is so, why hasn't there been an explosion of interest in grammars and why haven't in 30 years, there have been more products in the real world developed as a result of grammars?

Mostly because it is hard to make grammar interpreters and the

number of people involved are very small. Spatial grammars were birthed by Gips and Stiny and George Stiny remains one of the chief contributors in the area. There have been very few people who have had the focus on the field and the appropriate formal background to undertake the implementation of grammar interpreters.

Grammar interpreters are an absolutely necessary ingredient in this whole field, because without them we lack a test of falsification. With a grammar interpreter, we can talk about grammars, we can write down formal grammatical systems, we can explore some very interesting properties of grammars, we can devise grammars and generate derivations. After you have done a couple of manual derivations you never want to do the third one because they are long and tedious. At least for a guy like me they are long and tedious. So that is when a grammar interpreter provides for the field or would provide for the field, an important tool.

You are talking about a computational tool.

Absolutely, yes, a computational tool. Such would provide an ability to explore the epiphenomenon of grammars. The things that result from having a grammar interpreter are still largely unknown and out there in front of us.

Can you see this as being utilised in the field of art in any way? How far do you think one might get trying to apply it in the field of art?

I am on very thin ice. I don't know what art is and that is a very tongue-in-cheek thing to say because art is what the people who practice art call art. Just as artificial intelligence is what the people who practice artificial intelligence do. Like most interesting fields, it has no definition or hard and fast bounds.

If you are interested in thinking about change and thinking about structure and thinking about regularity, being some ways introspective about your work, and developing a body of work that show that there are developments over time then maybe grammars are a useful metaphor.

We've seen a lot of technological based art, computer based art in the last many years that has played out the ideas of computers in general. There has been a whole spectrum of stuff from just direct playing out of ideas of formal systems based on cellular automata to people who use computer tools as very sophisticated paint brushes, very sophisticated things to create effects that do not reveal anything computational.

In that former set where the computer is revealed in some sense in the art, there was an interest at least for quite a while in the use of fractal images in art. These varied anywhere from the black velvet stuff, to scientific curiosities, to some very subtle things where people were playing with possibilities in general—not only directly rep-

resentational but metaphorically as well.

Can you name a couple of examples?

Art comes by me and I look at it and engage in the making of it in some limited way, but I can't find in my head space to track it carefully, So I've seen in galleries and followed some of the computer art exhibitions and conferences, I have seen things but I can't, don't feel able to, keep a track of it as well.

But what I wanted to say was a fractal is a grammar—it is just a very simple form of grammar, end of story. Just take an object, replicate it at the next kind of level of scale, below the level of scale of object and keep on doing it and you get a fractal. That is grammatical, that is pure grammar.

So a grammar, you might define as a derivation sequence according to rules.

I think that is one thing a grammar does. In a sense the boundaries start to dissolve, you can define very crisply different kinds of grammars as formal systems. If you look at it metaphorically it is hard to look at those crisp boundaries and say that is what grammar is, that is what grammar isn't.

Any kind of formal mathematical system, virtually any kind of formal mathematical system can be characterised in some way that looks like a grammar, any kind of symbolic systems we use in computing, the ideas of grammars are absolutely embedded in that, they just flow through it, they are absolutely essential to so much in computation.

So when you say grammar is this formal system that you want to elevate and use somewhere in design, in essence you are just saying computers are the things we elevate and use somewhere in design because inside of any one computer there are a dozens, hundreds of grammars clunking away, doing various things for us.

Can you give an example through your teaching or through historical projects that you are aware of where grammars give a particular insight, allow particular changes of ideas to emerge?

I am surrounded by them, because I keep examples of student work and as you can imagine much of my teaching is tainted or coloured by using grammatical metaphors and I keep interesting models of student work on file. I have a model done by a student on an early Frank Lloyd Wright house that can only be understood by taking it apart and putting it back together again as a story of derivation and the story rings true with what Wright wrote about the hearth and the fireplace and it shows how a house gets played around that idea.

I have stacks of student honours projects in which we focus on first understanding one of the student's much-loved buildings, by creating a plausible grammatical derivation of it and then lay that outside

and have the student do her own design project where the only requirement in the end was that she also had to give a plausible grammatical derivation of that design project. You can talk to some of the students out the mind bending effects of looking at architecture introspectively this way.

Some of them are still tutoring with me, several of them are practising, one of them is at your university teaching (partly) about the influence of that exercise on their thinking. Several have attested to me, and I don't think I am bragging and I don't think I am saying anything that is not factual, that it was a marvellous focusing of the mind. Every student took something different away from it—by God it made them think. And it made them think about what they do when they make architecture.

Would you agree with the statement that design is computation?

Hell no. Absolutely not.

Why not?

I think of design as a phenomenon. It is a phenomenon out there in the world, it is a phenomenon that changes with time and with culture and with societies. It is a phenomenon that has much in common for all of us and differences for all of us. And like all phenomenona, the way I see it, is that we build models of it to study it and understand it and those models reveal some of its aspects and hide others and computation is one of those models. It is a very interesting and powerful model but it is certainly not something where I would make any claim that design is computation and I will gleefully attack and thoroughly shred anybody who makes this claim.

It was on Stiny's home page.

Cheeky bastard! I know George reasonably well, he is enchanted with the play of grammar and its echoes, how it echoes everywhere and he is fully aware of what things are. It is a very interesting intellectual tool for him.

When I asked Terry Knight this question, she said, "If you see computation as a series of steps of progression and then design would be computation because it would seems to have a series of progression." So, she sort of qualified her answer.

Yes, I just claim it is a useful model and that one can come up with several different useful models. One of the interesting things about looking at design as a phenomenon is that it doesn't seem that important to have a single dominant model emerge. But it is very important for disease. The germ theory of disease is the dominant model of disease. There are other models which don't seem to have much currency in our culture but the germ theory of disease is a

dominant model and design doesn't need that because we can have several models that each reveal something important to that design. I happen to be in love with the computational model because it does some very interesting things and it is one that allows me to make, to use the model to make, to make tools with the model and other models aren't like that.

Thankyou.

John Woods: Interview by Dean Bruton

Goldsmith University, London

29 July 1996

John Woods is coordinator of the Master of Design course at Goldsmith university, London. He is a practising artist and theorist interested in the philosophy of design.

Please introduce yourself and where we are and the background to some of your work.

Okay my name is John Woods and I have been an artist since 1965 making a whole range of interventions into various things involving manufacture, ecological designs. So I have always been on the edge of art since 1989 I have kind of moved off from being on the edge of art to being on the edge of design as an educator because I think designers have a lot of influence, the world needs more sensitive systems in place. So I am very interested in ideas and in philosophies of design and art and I suppose I do see myself as a practitioner primarily even though I haven't practiced for the last five years.

One of the things that we need to talk about is the idea of derivation, a sequence according to rules. Derivation sequence according to rules is known as a grammar. Okay. Can you think of examples of artists who appear to work with fairly strict rules and name a few.

Pierro Della Franchesca springs to mind. I think he was criticised for his attention to mathematics instead of what the Romantics would see as a more from the heart approach. I suppose it's more associated with the northern schools, Calvinistic and puritanical religious ideologies. Rules,—it's a very tough regime, when you talk about rules. I suppose thinking about all these interventions we are getting here you can also think of Cage and Duchamp and other kinds of aleatory processes which I am not sure whether you would regard those as rules as well. Rules that aren't rules.

I think that's part of it. Are there examples of artists who appear to work with fairly strict rules or artists that you could consider particularly prone to understanding through say codes or patterns or principles within their work that people could perceive.

Right, okay. I mentioned Pierro Della Franchesca and the famous case just moving on from that by association is ***Cézanne ?** and the notion that he was somehow looking for idealistic forms within what he perceived in nature and again I think there is an interesting controversy about whether the attention to those principles, in other words a kind of tacit rule system created or help to create a quality of work, so I think this raises a whole question of whether rules or

implicit or explicit from the point of view of the artists themselves because others may find rules and be sure that that's an important source and yet the artist may not agree. Conversely the artist maybe working to rules but there may be other rules but there may be other qualities that create what is seen as the essential qualities in the work. So it's a complex question really whether rules exist.

Would you say that mature artists have a much better idea of the formulas, rules, principles, codes, patterns that are in their work than novices?

Well I think one of the questions about the implicitness of rules might be the notion of writing and the way in which text has been inclined to formularise or to freeze certain patterns so that if you consider that medieval craft guilds that Donna Churn talks about then a lot of the processes of learning I think were learning and teaching by example in which case it may be more difficult to discern rules that in a process which is governed by a kind of legal systems or textbook grammars or behaviour and I think there is some interesting work by Dreyfus and Dreyfus in which they observe the practices I think its of pilots but certainly people who have very important manual skills and who are good enough to become instructors and then they start teaching how to do things and then they effectively give rules to the students but then when one looks carefully it is quite clear that they don't obey the rules themselves that they transcend the rules because they are highly skilled so there is a question there again about the implicit and the explicit, whether they are aware that they are transcending those rules is an interesting question. I don't know whether you can see this.

Can you comment on the idea of a contingent sense of grammar the idea that there are some artists that perhaps have a sudden change in derivation but there may be rules that appear to carry over from one word to another. Can you think of artists that might correspondent to that kind of idea and how useful do you see the concept of a contingent sense of grammar?

I think it's a beautiful combination the idea of contingency and grammar because in the Pedagogic sense I suppose we always assume that grammar is a kind of rule system and I think comes down and says when I obey a rule I do not choose I do it blindly so then we know that rules usually fail us in different situations so then the idea of contingent grammar maybe weakens that argument a little although I suppose you could say well it's a very important feature of the way that we think that we aren't actually kind of stuck in a predictable use of rules and so in terms of artists maybe the idea of a spirit which is there, some kind of quality of personality usually carries over but not always, you can't always see that.

But within the form of the work if you look at the forms of an artist. Let's talk about form, form making.

Right, well I had Duchamp in mind when you first asked the question and then you talk about forms, that's a challenge isn't it for the idea of forms because I suppose in some respects Duchamp was perhaps challenging the notion of form anyway in some respects or at least putting forward a concept as in preference to form in itself, so then does that then apply in terms of grammars. Well I am tempted to think about the way that the Police have this notion of *modus operandi* which again is just coming back to that thing about the explicit and the implicit. Presumably there are people who conduct their burglaries thinking that they are always smart and adaptable and invisible. The *modus operandi* theory says no, there are certain things that give us away and that we perhaps are unaware of doing but we do. So if Kline and Duchamp are interesting in that respect because they have gone through changes in their work formal changes particularly Duchamp. Again another keyword I suppose is chimera. Which is another fluffy word in terms of rules and grammars perhaps but moving from painting to something beyond painting perhaps has a kind of external rule which is to do with the notion of avant guard in other words breaking rules or creating new paradigms. So I suppose we all are subject, if there are rules at all, then they are rules within rules there are macro rules and micro rules that govern these changes and often what you notice is a shift, it's a sudden shift. So I think we were talking earlier on about the philosophy as opposed to mathematics and the way that mathematics seems to be very successful in fanning results through applying the rule system. Whereas philosophy almost revels or celebrates its struggle with rules and doesn't necessarily put a lot of store by rules so that I have kind of lost the track there.

Well you were talking about implicit, explicit, you were talking about the change of form that Duchamp had undergone and you were trying to I suppose rationalise the idea of macro and micro and you were getting to the point where you were trying to explain things outside of form I think. I was trying to hold you down to formal changes and changes in derivation and form.

I think one of the interface between the mathematical and the philosophical is the syllogism and I think there is a famous paradox I am not sure whether it comes from philosophy or mathematics but the paradox of the heap which is the idea that if you look at heaps of sand if you have a line of heaps, you might say that pile number 1 is the same as pile number 2 because they are so equivalent in size. And then pile number 2 is a very equivalent to pile number 3 and so you move along the line comparing adjacent piles. It is only when you stand back that you realise that pile number 1 is extremely small and the final pile is extremely large but you realise that is kind of typical of the way that rules largely become modified through language so the grammars often become adapted and adapted through time when we don't notice that. What we do notice are paradigm

shifts where somebody as you say is painting a black painting suddenly within weeks of painting white paintings or some other equally dramatic change. That doesn't necessarily mean that there has been a single rule change but maybe symptomatic of a whole structure rule changes and the boundary is suddenly sharpened at one point.

Okay, can you talk about well we have talked about a couple examples of work in these kinds of terms about the idea of rules carrying over from one work to another. So we have covered that. In your own work say as an artist do you ever think or talk about rules.

Yes I think I have used rules in an ironic way, certainly I have used the language of the law or at least I kind of tried to simulate it.

I did a piece which is a series of seven texts presented as images and the text described the fabrication of some form in fact and because I was trying to be extremely precise, pedantically precise with the language, very few people understood what the final form was.

In fact it was the description of a knife the proto-typical knife so it was almost like a patent application for the first knife. What I think is fascinating about "language", and I won't say "grammar" but language generally, is the fact that you, by creating something which is as precise as possible even in formalistic terms,—you inevitably evoke other connotations and it becomes all sorts of other things which are psycho-analytically rich. So again Freud would be interesting to listen to here—to think about grammars—but I am not sure you can interview him today!

Were there times when the way the form for these works or this work was developing did it change markedly from in a series of works about the knife or was it a one off situation and how did it change and why did it change?

Yes, I did make a version which was a knife but I think here again it's interesting to look at some of the ideas of Wittgenstein of where he talks about grammar—as grammar having essential and accidental properties. So this is always the predicament of any maker or any—I suppose any speaker or communicator too—that grammars always have properties which work better than others, some things work better than others.

As Wittgenstein said: some things can be said clearly so we say them and then there may be other things which are more difficult to imagine or think about which can't be said. So well,—given any particular grammar, so—in developing this knife, I used roughly the same principles as I had written about in specific terms. What I did was take a cylinder of brass in this case, and to hone it down into a V shape leaving one end exposed as a handle. Then when I made the thing I trimmed it off in such a form that it looked like it could have been a

Police truncheon that was used to create the knife.

So I took that opportunity that came from the grammar—the grammatical possibilities—in order to create something which could not have been so easily written about because it was very much a formal issue, and then I used I actually played on the fact that the language had a kind of C17the ring to it because I don't know I suppose we have memories of King James Bible language in my culture which probably informed whole sets of resonances about the law and the way that our society has interpreted notions of the law and brought them into currency in today's laws. So there is a lot of irony and a lot of very accidental eventualities and contingencies that I have pushed in a certain direction as an artist and I guess in that sense then I suppose I am coming around to theory a little bit now.

You have almost answered this. Are there other artists whose work you think particularly relates to ideas of rules and derivation?

I suppose I have seen this more in musicians than in artists and that is an interesting question isn't it why there should be more interest in musicians and composes in mathematics for example than there is in art and my theory is that it goes back to the early Greeks and their idea of music of the spheres and the way that visual images haven't really been able to be captured too effectively in say perspective systems for example there has been a lot of struggle whereas music I think fits into a mindset of physics in which vibration is much more important than in visual terms. So someone like Helmholtz I suppose is quite interesting there. He actually used mathematically ideas in both visual and in sound but there may be...Architecture too I suppose lends itself to that kind of structural thinking.

Are there any British artists that you might suggest?

Yes, well I think there is a tradition of the Bloomsbury tradition which I must confess a distaste for, which probably comes from some ideas of Hegel and attempts to find a kind of formalistic ideal which somehow carries enormous power and resonance so propositions of Greek statues without eyes because that makes them more formally complete, I think the idea of completeness is very important here and this is where I feel that the notion of grammar as I understand grammar is a very dynamic process and a lot of the plutonic thinking that has gone on behind a lot of these arguments in the grammatologists have been to do with finding a completion and a totality and comprehensiveness a look at perhaps you will correct me here.

I think we could talk about that a little bit more later. Do you ever use computers as a medium and if so what was your experience as an artist?

Well I should say that I, my wife tells me that I am an artist although

I have stopped making artworks in the last five years or so. Okay, but I do use computers I am deeply fascinated to know why I do. I use them for the usual stuff like word processing although I suspect they don't speed things up I am deeply drawn to mechanical systems, it is in the blood it's in the culture it's in the language. I think often where I have used computers again it has been ironic because I have been trying to present computers as fallible not as fallible but perhaps to parody computers as formal mechanisms that try and create certainty or closure in one way or another.

For example?

Well I did a computer play in 1969 at the ICA which was for kids which was called "King of the Shouting House" and it was a dance which was rather like a mechanical couple of concentric circles of actors. So it was a way of creating a deterministic system which was how I saw the computer but then bringing to it random inputs which would then lead to unforseen confrontations between different characters.

Could you say that this work in any way carried over from the knife work?

The knife work was much later.

In reverse.

In reverse. Yes I think I suppose I have fitted into a tradition of descent about the problems of mechanical culture that has been around since Marx and before and now that I suppose I have taken it on board in much more of a structured way in my teaching in trying to look at notions of nature and notions of autrefois?, mechanical autrefois? And electronics and well more lately genetics so I think that this is probably again where we might have a longer discussion about the origins or the belief systems behind the way that technology is regarded as being able to help nature or to go beyond nature.

Perfect place to start, yes.

Okay, would you agree with the idea that design is computation?

Right I could say no but it's tempting because I suppose I have a slightly mischievous notion of design anyway and I quite like Mike Cooley's arguments about the architectural abbes or I think it was Marx actually that asked whether we are performing as architects perform as all-seeing external manipulators or something or whether they kind of busily doing something that they are unaware of which is on aggregate what we seem to do as human beings. So the idea of design may be is rather a grand one and I think semantically design is a kind of application of a system even a very, very simple system such as a simple prediction so yes I think that the grandest notion of design does attempt to make predictive scenarios that will come true

and the big challenge now I think is exactly this contingent notion that maybe the deep green people would advocate in which we can't go along with this assumption anymore it's something that we have to be very careful about that the whole concept of design needs to be a little bit more humble.

How do you distinguish art from design?

It's very easy to do this in terms of traditions and practices and professional boundaries I suppose. I am always alarmed even though I am a child of sixties I am always alarmed by how the students are very cavalier about mixing the two terms art and design because I think there are kind of maybe even dare I say sacred or certainly transcendental aspects of art which I don't think design is meant to touch.

Can you think of a piece of design that is a work of art?

Ah, yes it is a highly subjective question that. I think there is some very good design, we talked about the underground London underground map earlier on. I think maybe this is something that O'Connor talks about that there is an aspect of art similar to philosophy which is unclosed and which has a calling for the other, so philosophy calls for art and art calls for philosophy because of their very nature, there is an incompleteness about it and that is part of the...

The use of rule based approaches to art and design education: Do you think that they would hinder or assist artists' practice, art and design educators to elucidate criticism about art and design?

I am very wary of that because of the political climate that we've seen in the last 10 or 20 years. Certainly in the UK and may be in the States as well. Often one finds that an interest in rule based systems is a symptom of an attempt to disempower or to overpower, rather than an enlightened offering. I think if you look at Vygotsky's ideas about the way in which conversations develop. I think he uses the term magnetic—like somebody in a conversation comes up with an idea and then other people are drawn to that idea. Then they work from that and then something else comes into the conversation. So that there is that kind of contingency looked at and analysed and you may say there are rules and this is a grammatical structure, which of course, it is. But I think there are very dangerous aspects of that.

Whilst an approach like that I think is constructive one. It's using in a way, a system. It's applying some form, or it's an attempt to. Its a generous view of rules, a rule based system, in which rules are identified or tendencies are identified and then used creatively. I think a blanket affirmation of this idea might be giving too much to the politicians, because often what we find in this country certainly is

that we have the national curriculum and education which is easy to see as a way of clamping down on possibilities. Systems would be welcome for that reason.

So you're a bit wary.

I am wary on that level, yes.

Thankyou.

Marco Zanini: Interview by Dean Bruton

Sottsass Associati Studios, Milan

24 July 1996

Marco Zanini is a partner in the design firm Sottsass Associati. Together with Ettore Sottsass and others he was part of the Memphis design group.

My thesis looks at both a loose analogy of grammar, and formal grammatical systems, as applied to art and design. Can you think of any architects, designers or artists who use strict rules in their work, or principles, or codes or guidelines?

Yes. A lot of them do that. Sol LeWitt is one. Peter Eisenman is another. I don't know very much about this field because first of all I am not a theoretician, at least in that sense. Secondly because I have decided in my professional approach or my thinking that there are much simpler levels at which to approach reality where it is possible to operate—rather than on these levels. I respect this kind of work but I am not an expert in this kind of work.

When I think about languages I think about completely other languages. Basically I think about the languages of the people rather than the languages of the intellectual which are, say, a layer on top of it. Since the problem that I would like to address are people's problems, and it is possible to address them at their level then why should I address them at the intellectual level. At least for me there is no need to do that.

So let's say when the problem is to design a city as has happened to us. The problem is how to make the life of the city livable for the people. The people do not need postconstructivist or neo constructivist grids rather than square or circular grids or a garden city grid like in Canberra. People need trees which they will not get because the cost of land is too much and the people want to make money on the land. They probably need nature, they need shadow, they need light they need water they need a lot things which are in competition not with the with a theoretical view about the layout of the city but they are basically in competition with the economic factors. Who is paying for this, nobody wants to pay because the government doesn't have money. The one's that want to make money don't care anything about the quality of life of the people. So the basic issues for me are political not theoretical.

As a designer do you have some rules or principles that you would repeat from project to project. Some things that you do every project that you find yourself repeating over the years?

Absolutely because this is human. Every artist or professional has or

he is able to control a very limited band width of language. So I do use languages which have colour, shapes, geometric forms, drawings, processes, materials. But again, this is for me more an historical process and let's say another layer over decisions which are all not theoretical and are extremely practical. This is my approach. This is my philosophy.

There is a use in this research such as the one you are doing on languages and there is a discourse to it but the question is are you basing your activity on this theoretical basis or are you basing your activities on political choice? I am always basing my decision, my activity on the political base and the language is something that is extremely flexible, to adapt to every condition.

My attitude would be a little bit of both. Mainly political probably because I am interested in improving art and design education. I want the decisions that artists and designers make to be more accountable, that is, more transparent. I want to help people see better ways of evaluating art and design judgements. And so that is political.

Yes it is. Accountability for me does not exist in art because art is for me a level of human life which is very difficult to, let's say evaluate with any kind of scientific meter or any kind of rationale meter if you want. First of all it is an activity that tries always to discuss the current situation and it does through unusually creative methods. For me its like a bunch of dogs which are trying to attack an elephant and the dogs have no fight really with the elephant because the elephant is so big and his skin is so thick. No matter what the dogs do,—they can do very little really. But there are maybe some very vicious mean dogs who can attack the nose of the elephant and do some harm or there are some small dogs who can do nothing but yell at it and stay on the side and that for me that is the method of poetry.

What can you do with poetry? Nothing really. Not much and yet in the history of mankind poetry has had a huge impact and has a continuation because there is a role in society, in human life for poetry. But really if you look at the relationship between poetry and the capitalistic society what is their power? In 1955 there was an attempt to change society through poetry but it failed.

So, in the question you use a very precise word you use accountability. Accountability is a tricky word because on one side it is a very precise word and has also a political meaning but I think it is inappropriate because you don't ask an artist to be accountable. You ask them to be good.

Do you ask critics and teachers to be as helpful as they can in elucidating and articulating the decision making?

By whom?

By the artist or designer.

The true artist doesn't care about just about anything. If you look at the life of Van Gogh who has painted I think 169 paintings and has sold one when he was alive. I think a doctor or someone lent him some money. So, but nevertheless he was completely convinced what he had to do and he went on doing it. Other artists are more successful.

Michelangelo was a great dealer and wheeler with the Pope and with Medici he got away to do great things, but because he was a in a relationship with power but he still did what he wanted. And this is the only thing if you want to use accountability, which I ask artists. To be good. To be meaningful, to be shocking, to be interesting which today doesn't happen because art in a sense is a victim of democracy as it is. Everybody is fully entitled to be an artist. Men and women, black and yellow, everybody, which is basically true. But the beauty of art is that there is a history which is a steamroller. It rolls down 99.99% of everything and then some small things remains. This is my only way of thinking in art, is what is left? Let's see what's left? Because of what is happening nowadays I do not understand personally. I have to admit I don't understand 99.9% of what they do. For me in most of the things that do not make sense, I have said this publicly in Australia too. I am very happy that everybody is entitled to wake up in the morning and decide that he or she is an artist and has to make a strong difference in Central Square in Sydney but for me that doesn't mean they are artists.

Let's talk about designers. Do you see architects that produce much work, a lot of work applying formulas so they can produce more work than other people? Are they more successful at producing quantity because they know their own style for example?

This is exactly the danger of your thinking—that it brings to this kind of question. What is architecture today? Again architecture today is 99% construction and 1% architecture. This again is a very political issue because people want to drive Mercedes and they have to build a lot of buildings to get to buy a Mercedes and keep their wives happy. This is nothing to do with architecture. Architecture is another process. If you look at the city you see that 99% of what is in the city is buildings and 1% sometimes is architecture. In the European city where we have 2500 years of history and the layers of the city are very thick, there are some, —the business of architecture have survived because the people have destroyed a lot of the buildings a lot of the time. Correctly so because a building is a function of its time. And so the houses of older times are not good any more to live in. Unlike buildings such as the Colosseum and some Roman architecture that has survived.

So my problem is to architecture not to the building. And to do

architecture you don't want to have rules because again, the rules, the methods, or the styles were very much an historical function in a sense, that every period has had its dominant style.

Yet at the same time, Boromini or Bernini, and great Italian Baroque architects. When they started to do their Baroque they were at the end of their Renaissance times, so they were revolutionary at the time. Then their style has become dominant.

I think today this very fragmented society you don't really need any style because thanks to God probably there is not any more dominant style. And anyway the avant garde is to fight the dominant style in any case. Because the dominant style is that the demonstration, the affirmation of a certain power and certain ideology.

In fact if you want to say what is a dominant style now, a dominant style now is so called a modern international style which is a sixties American product of steel and stainless steel and glass boxes designed for Wall Street offices. This is a style to which I take great exception.

Can you see rules that appear to carry over from one project design to another? Is that the case in your work?

Every historical time and every political work has rules. It would not be very easy to define the rules, in at least in our case, because we are working internationally and therefore are trying to let's say meld in every culture which we work, so why should I use Italian rules or Swiss rules when I am working in China. When I work in China I try to define a new set of rules for a modern Chinese architecture. But I would like to be Chinese because I am building in China. And in reality the same applies to product design because we are not designers that have to assert their style. Norman Foster is one of the great high tech architects. He has his own style. Whatever, where ever he designs that's his language. OK? Cast iron, big poles, cubes, glass and so on. That is his idea of architecture. My idea of architecture is very different. I design for certain people, in certain conditions, in certain cultures, in certain cultural environments and I am sure we have some rules.

Would they be process rules? Say, like you always look at the situation. You always talk to the people?

Yes, the most important rules are the process rules, that are a set of thinking that is not formalised in any rules but that takes into account whether we are doing the work in relation to the context that we can apply. Formally its the use of materials, even the specific geometric approach to things, but luckily we don't qualify a set of rules but we are also trying to break all the rules we set by ourselves, not every rule, but we try to break at least the formal rules.

So that's the rule, break the rules.

Yes, One of the rules is to break the rules because we believe there are no rules. That is the basis of it. We believe that every rule is in terrible danger of putting process in a cage where it shouldn't be.

Could you talk about one or two examples of your work to explain it in more detail. Maybe the use of its process rules and how you subvert the idea of using rules. Is that possible to see or discuss a project where this has happened?

For instance, it is difficult to say when you break a rule when you try to break it all the time. Let's say that our approach to every project is free. We don't preset programs or agenda. We work on everything from teaspoons to cities, from airforce bases from private houses to gas stations. This is an experience which allows you to think that there is very little of common rules to be applied to such a large project.

Let's say for instance we are designing an interior of an airport. What is our approach? Our approach is: we have to defend the psychic state of the passenger because the passenger is a tired guy who is waking up in the morning and he has to take a long taxi ride to catch an early flight. He is tired and doesn't want to be stressed by bad design or too much advertising. He wants to go to the airport as fast as possible. When he comes back he is probably tired from the day at work or from a long trip wants to go home as fast as possible. This is the set of rules. This collides with just about everything that is an airport today because an airport today is a place full of advertising because there is a lot of people and it is a very good place for advertisers. It is a shopping centre which by the way has aeroplanes in the parking lot. All this modern capitalistic world has a vision of the old problem which has nothing to do with flying away or arriving and being peaceful.

Our problem is outside these issues. I try to make the airport a simple and quiet as possible. Because the airport is in Italy, we tried to make a Mediterranean feeling. So we used stones, yellow stones on the walls, even though it is an interior because the site is so big, and we tried to make the signs as simple and as readable as possible, and we are making the seating calm and comfortable and quiet. We are trying to take away the design as much as we can. The cause is very peaceful and the light is subdued.

Is this the process of the rules? It is a process of a way of thinking but not the way we rule because we did not apply in this project any preset rules that go beyond or are before what we are doing. We didn't say we want to follow this set of rules to go to the objective. We went straight to the objective and said what is the objective? We tried to be as direct as possible. These are the basic facts.

Perhaps we could direct the conversation more to form making. At the airport, how did you decide on the final form of the airport? The forms of the interior of the airport—how could you

describe the possible ways of seeing that as principles or using principles or subversive principles?

The reality that if you follow a very down to earth thinking process, the space for rules or guidelines is very limited because the whole process goes in another channel. Theoreticians are trying to analyse process and try to find out if there are rules that can be communicated to other people. The reality is that this is very seldom true in our experience.

From a formal point of view we tried to be very rational in the design of this airport. For one reason, not because we are rationalist. In fact we are not. But since airports today are very chaotic. People are using monitors and bars here, sitting there, checking in there. The operation of the airport is very chaotic. We think that chaos is in a sense is tiring for the people. We think that if people see a little of rationalism, a little logic they will relate better to it. At least in a place where they have to go through certain processes like checking passports, finding luggage.

So we try to be rational as much as we could because rationalism in this case is functional to recoup a peaceful state of mind of the people. When we did that we went completely irrational. We had furniture which had several different materials and they weren't on a straight line. Why? Because in that case we wanted to break the rules of the bourgeoisie. What was called the Italian look in the seventies, which was nice chrome and Cuban black leather and few other elements which was dealing an idea of cold form and statues and style which we found hideous because it represented the bourgeoisie image of the house and we think the bourgeoisie is the most idiot class and that we should fight against that lifestyle because for the good of the people.

So what I am saying is that in everything you do if you follow a certain ideological process which can completely change from situation to situation sometimes you have to be extremely quiet and realistic and simple because the conditions are like that. Sometime you can go completely crazy because the conditions are different. Then, rules at least in my opinion disappear.

What is an important rule: economy. Some people are six feet tall or they are short so they want to be seated on 45 cm high and the table has to be between 74 or 78 cm. This is a rule. Again, it is a human rule because the people are the right kind not because it's an absolute rule. In fact we can even say let's make an office chair uncomfortable, because we don't do that too much. We would say let's make a chair uncomfortable because we don't want the people to be seated ten years ago we wanted people to be seated at a table. We want the people to be seated at a computer for five hours and then go to the beach so if you are making office chairs very comfortable it's on a certain level not only giving a good chair for the people but

it is also making the people work better or produce better or work longer. Maybe we don't agree with that.

Will the bigger ideological picture ultimately end in a catalogue with forms?

No, not for me. There is no need. Again, do we need this kind of rules with this kind of thinking? The answer is no for me. I do not need it. I can work very happily without any set of rules.

In fact one of the things that is killing architecture and design is rules, because nowadays at least in Europe you cannot do anything. Because in Italy there is a fire regulation, there is a handicap regulation, there is a economic regulation of some kind or there is a building code, a completely idiot building code or there is a taste of the heritage foundation to protect the certain origin. We are living in a state of incarceration, total incarceration or rules that are completely meaningless in most cases. And one rule collides with the other one many times. This why we are happy to work in the Orient, because the Orient culture does not want rules, no problems. When we are building in China or India nobody gives cares about any rules, even the handicap rule which can be reasonable. We build architecture because architecture has always been not very respectful of boundaries. With today's building codes, every building built until 100 years ago at least is illegal, including the Colosseum, the St Peter's Dome, you name it, it is illegal. Who is right, who is wrong? The building code or the guy who build the Colosseum? The answer is simple.

Do you ever use computers?

Yes, we do use computers.

What is the extent you use the computers for design?

Computers are a tool and every tool has to be approached with a defensive level or a very high level of awareness. We use computers because nowadays you must. They have a potential, but at the same time there is a risk because computers are mathematic machines and they do certain things. They don't do water colours so when you design using computers there is a risk and this risk is real. If you look at the graphic design or the television computer animation you see that they are extreme powerful and they are changing the language. With computers now for instance in film animation, you can do everything and this is very dangerous because society tends to follow the easiest process and not always the easiest process is the best. Before computers, you needed a good actor to do a decent movie and to give a very strong expression on his face, nowadays you can go back with the computer. That is very dangerous.

But again why? What is the measuring tape? The measuring tape is that you can't get away from the human part of the body to the machine part of the world. It's a judgment. The writers or intellectu-

als that are interested in cybernetics think we should have a completely artificial reality. I don't think so. It's an ideological division.

I went to La Scala last night for the first time and I saw the ballet, *Copelia*. Would you say that kind of thing encapsulates your attitude,—the idea that there are bigger issues than an automated world might consider?

Yes, you have to decide on which side of the fence you are. For me, my culture, my education has brought me to an approach which is ideological and political. I must say thanks to God it is an approach that is ideological and political, but in a very relaxed way. In the sense that twenty years ago if you were in the early seventies there was a very radical political faction in Italy and Europe which tended to have end to end collision with reality. Nowadays this approach is much more mellow because communism failed, the market is dominating all the world and so the relationships are different, but some of the issues are the same. I think this is a global approach that after which all the rest is happening let's say on a free form but is very much consequential. Within this happening there are other very important grammar or language aspects which of course are not dealing with at very sophisticated level.

Is it possible that you could see "Design as computation"?

Mathematics?

Do you agree with the statement that "Design is computation", computation perhaps as sequence?

No. I believe that design is life. Life has nothing to do with mathematics. Music has a certain relationship with mathematics. Of course physics has a lot to do with mathematics, architecture has had aspects that are related with mathematics, ie when you do a plan you can decide that it is this long, and this wide and things like that.

But you can also decide on the surface you use 30% of something and 30% of another thing. You can balance colour, you can do a lot of things but I refute the idea that there is a scientific reality behind because it is not true. Thanks to God every building in Italy is not straight. Why should we build it straight if it does work so much by not building straight?

Would you say that design and art are the same thing?

No. Design is normally a profession which sometimes goes to certain level of qualities where you can approach art. Art for me is a very mysterious, different process that is for this incredible revolution of society is today very difficult to understand but still we have a many years in history of which we see very clear processes and not art as being in art work forms. It is hard to state what meaning art has had, from Greek sculpture to Spanish Baroque from Muslim architecture to Chinese or Japanese paintings. Two completely different histories.

What is art today? I don't know.

Can you give me an example where design has become art or is art?

One of the few things that for me are very clear in work as art in the 20the Century is that art has been democratised. Before during history, art was either an ethnic product of a certain culture which was very popular. Whatever the art of the American Indians is, I don't think very much of it, but we still have it. That was the product of their culture and at a very popular level. On the other side, the Taj Mahal was the image of a certain mogul emperor in Agora and was the expression that speaks of a certain problem of the dominant culture. It had nothing to do with the Indian people. In the 20the Century, for a lot of reasons art has become definitely democratic. In a sense that pop art or rock and roll or other things have brought again art now on the popular level, with the gross of the population in terms of communication and culture. In that sense the definition of what is art or what is not can be more fuzzy and undefined and in that sense design can become part of art.

Is there an exemplary piece of design say that you could name, say in architecture or engineering?

Not that I could not, not because I don't think there is. There is no red lines in reality. Until this millimetre, this micron, angstrom unit—it is not like that. It is life and everybody has their own opinion, somebody can say that art is industrial product and some will say it is not art. Who cares?

But what would be an exemplary piece of design?

It is a very American way of thinking. Let's say the space shuttle is a beautiful object. Why? Exactly because it's not design, it's engineering in a sense. It's engineering made with so much care and passion and within such limited boundaries that it becomes of high quality so for me what is interesting is quality everywhere. It can be a sculpture like the bronze Hellenistic statues that were found in Southern Italy. These are very beautiful objects. All the African art was not made to be art. The culture of African art was nothing to do with the reality of Continental sculpture. In Africa objects are ritualistic tools for let's say life's awareness or for other processes. So the reality is completely fuzzy. There is no grids. You can try all you like to drawn lines, to put them in grids it will not work in my opinion. But there are a lot of people that are trying to do that.

What are the qualities of the Space Shuttle that you admire?

If you look at it, it is symbolic object of a certain age. It is like if you want to make a map—and you can put a Haiku poetry of the sixteenth century Japan, you can put a bridge between the Swiss concrete architecture of Maillart or you can put a painted book of the Mogul times. Every time has produced objects of extraordinary qual-

ity. Probably the Aborigines too, when they put stones, four white stones on a rock in the shape of the Southern Cross layout in the middle of nowhere. They do a fantastic art of great quality, of great intensity. Especially for me that intensity needs some nature and this is what I respect. Whatever people do, I am always very interested and respect what they do provided they do it with a quality and passion that is possible. I am completely uninterested in 99.9% of sculptures produced today because I don't see any quality, I don't recognise any quality and maybe I will recognise quality in something very minor in some forgotten place. This is a very personal product analysis. Completely irrational.

Are you talking about Zeitgeist?

Objects always seem like their time. Sometime they reach it, sometimes they don't. Everything we do is a function of a number of processes. We do it in a certain time, in a certain moment, within a certain context within political context, within economical context we do it. It is a problem of its time and place. The problem is the awareness of which we do these things is most of the time very limited. Only a few special occasions you reach a certain level of quality. That's what we try to do. We don't achieve it, but we try. And maybe sometimes we achieve levels that are interesting. Again, accountability, how can you measure this kind of stuff? How can you measure it? How can you position it?

Grammarians would say that you can find rules for producing a particular kind of product and if you get those rules right then other human qualities will emerge with the application of those rules.

But I think they are wrong.

Thankyou.

Dean Bruton (1997) Grammars and Art: A Contingent Sense of Rules.
In: *CAAD futures 1997: Proceedings of the 7th International Conference on Computer Aided Architectural Design Futures held in Munich, Germany, 4–6 August 1997, pp. 71-82.*

Relating Computers to Designers' Judgements of Good Design

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Abstract Computer systems offer a variety of specialist applications in the design process intended to assist in achieving good design, including CAD, expert and virtual reality systems. This paper explores questions of whether designers in different fields use common concepts, metaphors or models in the judgement of good design. A literature survey found few significant comparative studies across different fields of design. A small pilot study, of four experienced designers, investigated the fields of architecture, engineering, graphic design and industrial design. The investigation sought qualities of design used in the judgement of good design. Each designer described a design exemplar in each of the four fields under investigation. The descriptions of design exemplars identified many qualities of design. The fully transcribed recorded interviews were analysed using phenomenographic analysis. From this analysis, five qualities seemed to be common to the four fields of design chosen for the study. Although too small a sample to warrant generalisations, the pilot study suggests that future research is worthwhile. Since designers are free to construct a match between present and foreseeable understandings of good design, and the means they choose to achieve good design, the paper then examines the relation between results and present and predicted computer applications.

1. BACKGROUND

The general definition of design and the understanding of general principles of design have been sought for the establishment of design as a distinct discipline for a significant period of time. The development of models of design and designing since the 1940s has resulted in a vast literature of complex and diverse explanations of the design process. There is a smaller and less technical literature on exemplars of design (Drexler and Daniel 1959) (Kaufmann Jr 1950) .

The need for a clear consistent explanation of design has been a constant preoccupation of designers across many fields of design but comparative studies of design and designing across different design fields are few. From a survey of the literature, comparative studies are only done within specialist fields for particular problems of a technical nature.

Initially, my aim was to compare approaches to design, and approaches to looking at designs, in a variety of fields to seek what (if any) were the

common characteristics of designing. The attempt to find recent comparative studies of design proved difficult. Database searches produced technical research studies in business management (Santhanam 1989; Cook 1990) engineering (Friel 1988; Welsh 1989) and computer science (Geller 1988; Goel 1989) but significantly little in terms of comparative studies of design as a distinct discipline. The interdisciplinary nature of design proved to be supported by the framework of the current libraries system only because descriptors used such as 'design', 'grammar' and 'systems' are found in studies which show a wide variety of research topics.

The impact of recent computer systems upon the judgement of designers has yet to be studied in detail. A government instigated urgency for exportable value-added products in a troubled economic climate has generated a redefinition and evaluation of computer packages in terms of their end user's needs. Now may be the best time to examine the potential for development of design tools which address the best of available design wisdom concerning good design. A better understanding of decision-making in design may provide additional alternatives to a dominant economic rationalist mode for judgement of good design which seems to be prevalent amongst those advocating more extensive use of computer systems.

Some fields of design, such as graphics, have been traditionally bound with modernist aesthetic notions of excellence. At the turn of the century, the emancipation of design from fine art in and its re-categorisation as a distinct discipline has been a stimuli to advances in knowledge. This recognition requires a grasp of both the wider philosophical allegiances of science and of its socio-economic dimensions (Barnes 1977). The development of international design discourse has been a consequence of this awareness. For example, in linguistics, Michel Foucault focused not on texts or authors but on 'fields' such as economics or natural history and the conventions according to which they were classified and represented in particular periods (Foucault 1970). Roland Barthes contributed fresh approaches to the understanding of visual language as an intertextual construct full of cultural codes (Culler 1983).

However, Victor Margolin comments:

> Although there is not yet a strong movement within academia to bring the research on design and related topics together within a distinct disciplinary framework, there is nonetheless much valuable work being done. Because this work remains fragmented, many important questions are still unanswered, particularly those that have to do with the cultural and ideological grounding of design theory and policy. Hence, there remains a fairly sharp bifurcation between theories of design, and studies of design as a part of culture." (Margolin 1989)

Despite the recent backlash against the scientific rationalist approach to knowledge representation by AI, the design world has embraced the use of computer systems in industry and education. The use of interactive multimedia systems may soon dominate design educational technology as Bill Gates predicts, "...within three or four years teachers will be creating their own multimedia experiences." (Wood 1992). Predictions such as this may herald the demise of traditional disciplinary boundaries as knowledge and experience is repackaged by multimedia software. Computers have become part of people's lives in so many ways, yet the assimilation of the electronic

information age has yet to comprehensively facilitate the understanding of modes of evaluation. A study of designers understanding of good design may be a step toward this goal.

2. THE PHENOMENOLOGICAL STUDY

So far only a small pilot study has been carried out as a precursor to a larger study. This pilot study involved four experts in the fields of Architecture, Engineering, Graphic Design and Industrial Design. The experts were chosen because of their reputations as recognised experts by their peers and because they were able to disclose citations of design awards and are active in the field of design education and practice. Furthermore, for a pilot study they were all conveniently located in Adelaide. The nature of the study was exploratory as it sought to identify possibilities for further hypotheses to be developed.

Rather than ask directly about qualities of good design, the study used exemplars as a means of defining the qualities informally. This was done to avoid any reliance on the designers' standardised preconceived cognitive frameworks and to allow perceived qualities of good design to emerge. The aim was to discriminate the connection between theory and practice in keeping with recent interest in the analysis of the role interdisciplinary knowledge can play in product development (Gruber, Tenenbaum et al. 1992) The use of exemplars as guides for practice has been initiated in established Australian design circles. The Australian Academy of Design initiated a project called *Corporate Heroes* in 1992. This project was expected to provide exemplars of enterprises which use the design process properly and well (Design 1992) .

3. PROCEDURE

Interviews were recorded with each of the four designers. The interviews were approximately 45 minutes each. All interviews were carried out at the institution where the designers worked. The interviewees were given at least two weeks to prepare for the interview by selecting four exemplars for discussion, one each from the four fields of Architecture, Engineering, Graphic Design and Industrial Design. The interviewees could all be described as white, middle-class, male and Anglo-Saxon. The nationality of the group consisted of a German, Englishman, Scotsman and an Australian.

Each interviewee received a letter describing the project and a list of interview questions. The larger study will seek a more balanced sample but there will be no attempt to make statistical inferences from the sample. Each interview followed the same question format but there were some inevitable digressions. After the interview, the four exemplars were discussed briefly on video tape to provide a visual recording of the occasion and the chosen items under discussion. This also acted as a visual summary of the interview and lasted no more than five minutes.

The interviews were transcribed and analysed using phenomenographic (Marton 1986) and factorial analysis techniques.(Martin and Milton 1991) A

summary of the results were then compiled in a chart and are presented in Table 1.

3.1. The Interview Questions

After the initial acceptance of the interview appointment, the list of questions shown below were decided upon:

A Comparative Study of Exemplars in Four Design Fields: Interview Questions

1. Describe the four examples of good design that you have chosen from the fields of:
A) engineering,
B) industrial design,
C) graphics
D) architecture
2. What are the reasons for your choice?
3. What does each example exemplify? — What are the qualities that you look for in a good design?
4. How do each of these examples show these qualities?
5. Do these same qualities characterise all good designs in this domain?
6. In your view, do the same criteria apply in other domains of design?
7. Could briefly describe your personal philosophy of design?
8. Style — How is it defined? ; How important is it?
9. To sum up, what are your 'rules' for good design?
10. Is there anything you would like to add?

3.2. The Interview

The interview questions began with a description of the four exemplars of design that the interviewee had chosen. This often led to a justification or diversion, perhaps as a result of the uncertainty of the focus of my study. I had purposely tried to deflect any detailed inquiry as to the exact nature of the research. Nevertheless, it was necessary to explain the project to the architect in order to satisfy his curiosity concerning the nature of the study. The others were content to participate without undue explanation and appeared to have some degree of confidence in the value of the exercise.

3.3. Analysis of Data

Generally, due perhaps to the difficulties of identifying and describing visual attributes in a spoken language some exemplar's qualities were described with vague and general ideas. This also may also have been due to the brevity of the interview. Often, participants had trouble in going beyond the assumptions that "this item just works". Brief truncated descriptions resulted from the attempted articulation of the physical properties of design. Often, participants assumed the quality they referred to was obvious to others. The most difficult problem remained elusive: the identification of the distinctive properties that made the item exemplary. In all cases, the participants stressed the designers' concern with the satisfaction of a human need. It seemed that the 'humanistic qualities' of the item was identified as the deciding significant factor for good design.

Furthermore, some participants held the view that some qualities of design are elusive, perhaps indefinable. For example, this point led to discussions of the nature of religion, philosophy, time and space in the case of architect.

Another interesting point is that the description of the design exemplar from the interviewee's own area of expertise was often far more extensive and

confidently expressed. The interviewee's responses to their own specialist fields indicated commonalities (such as the idea, "timeless") more often. The analysis of data shows that some qualities of good design are common but that designers appear to have their own specialist values and understandings of good design. Attempts to discern patterns of qualities across different fields were hampered by individual differences in language use. Some designers used general descriptions while others described physical properties in detail. Some fundamental terms were not used often. For example, the term "purpose" was identified by the architect as common to all exemplary design:

"What I really see in all of those [exemplars] is purpose. Purpose of human effort and human mind to aspire to, if you wish a higher goal, each in its own field." (Bruton 1992)

Whilst schema for good design were assumed to exist (at least to some extent) by the designers, the identification and elucidation of any schema across different fields of design appears problematic. The development of computational design systems which endeavour to incorporate the judgement of good design may need to take these factors into account.

3.4. Tables of Findings

Table 1 presents a summary of the terms used to describe qualities of design mentioned by the interviewees. Each exemplar quality was chosen because it was mentioned in response to interview questions. For example, when describing their understanding of qualities of good design, all four interviewees used the term "human" and "time" (in reference to "timeless").

3.5. Selection of Qualities of Good Design

The selection is, of course, my interpretation based on a phenomenographical analysis. The original transcripts are available for further analysis. Selection of terms was based on the recurrence of terms used to describe identifiable qualities of design exemplars. For example, the term "time" was selected because it seemed to represent the notion that a design exemplar could continue to relate to many people over a long period of time. The number of times the term was mentioned was recorded for comparison, bearing in mind the possibly changing contexts each term may have throughout the interviews. Those qualities which were not mentioned four or more times may, of course, still be significant.

4. TABLE 1: QUALITATIVE TERMS

The terms shown literally in the Table 1 below provide a comparison of the use of language and design concepts by the four designers. Some terms are used frequently but not in specific reference to a quality of design. Actual occurrences of references describing the design exemplars are shown in Table 2.

Common terms used by interviewees are shown in bold. The numbers are included to indicate the frequency of the use of the terms and do not represent any indication of a particular emphasis in a designer's view. No statistics are involved in the calculation of these figures except the simple addition of the frequency of the use of each term.

Architect		**Engineer**		**Graphic Designer**		**Industrial Designer**	
people	**19**	material	33	**people**	**48**	**people**	**34**
human	**18**	**time**	**29**	**work**	**37**	**time**	**21**
time	**15**	automat	20	**time**	**18**	**work**	**18**
new	12	**people**	**18**	read	16	need	17
dimension	11	appeal	19	entertaining	13	**human**	**7**
open	11	**work**	**14**	communicative	8	exciting	7
context	9	**human**	**7**	reflective	8	light	6
green	8	robot	6	visual	8	economic	6
balance	8	ergonomic	5	informative	7	quiet	5
spirit	7	comfort	5	comfortable	7	material	4
clean	7	economic	3	exciting	6	invisible	1
work	**4**			**human**	**4**		
material	4			context	1		
exciting	1						
economic	1						

Table 1. Frequency of Qualitative Terms used for Design Exemplars

5. TABLE 2: DESCRIPTIVE TERMS USED FOR QUALITIES OF DESIGN EXEMPLARS

Descriptive terms for exemplar qualities mentioned less than four times also are shown in Table 2 below. The total word count for each interview (in descending order) was as follows: Engineer: 7581; Architect: 6012; Graphic Designer: 5783; Industrial Designer: 5379.

Those terms used four or more times in an interview are shown in bold. The design exemplars described are listed in italics at the top of each column. The design fields are shown in rows and the designers views are represented in the columns. For a more detailed discussion see the working paper, "Computers and Design Excellence; a pilot study relating computers to designer's judgement's of good design" 27th August, 1992, University of Adelaide.

	Architecture		Engineering		Graphic Design		Industrial Design	
Architect	*Residence*		*Mies' Pavilion*		*Junger Design*		*Tizio Light*	
	people	**6**	**open**	**5**	**people**	**4**	**balance**	**8**
	open	3	**clean**	**4**	spirit	2	**time(less)**	**4**
	human	3	detail	3	new	2	**human**	**4**
	new	3	classical	3	communicated	2	people	2
	dimension	3	Platonic	2	open	1	dimension	2
	green	3	time (less)	1	harmony	1	new	2
	time (less)	2	human	1	balance	1	harmony	2
	spirit	1	lasting values	1	beauty	1	green	1
	structure	1	elegance	1	purpose	1	open	1
	formative	1	crystalline	1			perform	1
			crisp	1			structure	1
			purpose	1			innovative	1
							sculptural	1
							purpose	1
Engineer	*Gazebo*		*Production System*		*Cascade Label*		*Ducati SS 750*	
	human	3	**material**	**31**	appeal	3	**visual appeal**	**8**
	people	3	**automat(ed)**	**20**	vision	1	**material**	**6**
	reliable	3	**cost**	**9**	attractive	1	comfort	2
	cosseted	2	**robot**	**6**	feeling	1	people	1
	attractive	2	**time(less)**	**4**	colour	1	ergonomic	1
	appeal	2	reliability	3	imagination	1	human	1
	comfort	1	ergonomic	2			aesthetic	1
	ergonomic	1	efficient	2			exciting	1
	principles	1	human	1			controllable	1
	protective	1	attractivity	1			principles	1
	practical	1	manufacturable	1				
	restful	1						
Graphic Designer	*Pompidou Centre*		*Sydney Harbour Bridge*		*Exhibition Catalogues*		*No Example*	
	people	**9**	**people**	**8**	**read (able)**	**16**	"not from	
	work	**4**	**entertain**	**4**	**work**	**13**	personal	
	informative	**4**	work	3	**people**	**12**	experience"	
	comfort	3	time	1	**time**	**11**	personal	
	exciting	1	position	1	**communicate**	**8**	experience"	
	cost	1	focal point	1	**entertain**	**8**		
	innovative	1	functional	1	**reflect**	**7**		
	living	1	unique	1	**inform**	**6**		
	entertain	1	beautiful	1	**human**	**4**		
			visual	1	**visual**	**4**		
			symbolic	1	**exciting**	**4**		
			strength	1	comfort	3		
					impact	1		
					pleasurable	1		
Industrial Designer	*Yulara Resort*		*Yarra Bridge*		*Logo*		*Fan Heater*	
	people	**11**	**people**	**5**	**work**	**4**	**people**	**13**
	work	3	**exciting**	**5**	**quiet**	**4**	**need**	**12**
	time	1	**lightness**	**5**	people	3	**work**	**5**
	invisibility	1	material	3	time	3	**time**	**5**
	feeling	1	vital	3	complimentary	2	price	3
	profession	1	tension	2	profession	2	sculptural	3
	functional	1	profession	2	low key	2	functional	2
	low key	1	creative	2	timeless	2	material	1
	sensitive	1	intelligent	2	restrained	2	maintenance	1
	interesting	1	work	1	careful	1	decorated	1
	interactive	1	low maintenance	1	simple	1	aesthetic	1
	careful	1	timeless	1	functional	1	experimental	1
	beautiful	1	decorated	1	unassuming	1		
	intelligent	1	dynamic	1	plain	1		
	tension	1	strength	1				

Table 2. Qualities of Design Exemplars

6. THE IMPACT OF COMPUTERS ON DESIGN

Recurrent descriptive terms for qualities of good design indicated some commonalities of design, at least in the four design fields studied. The 'qualities', as identified by the terms used in the interviews, that seemed to be common were:

- Communicative/functional quality
- Attractivity/Aesthetic Appeal quality
- Timeless quality
- Structural quality
- Human quality

If these five qualities are important how do they map on to the areas where computer systems can have an impact on design? Can computer systems incorporate considerations of common judgements of design excellence? The reality of design compared to the predictions and claims of much of the literature on computer modelling of design seems complex and conflicting. The various fields of design have specialist criteria beyond the obvious functional and formal common denominators. There are difficulties in interpreting the exact nature of terms and the application of those terms to different objects. Commonalities of design only apply to different fields of practice to a very limited degree. It appears that the use of a knowledge base for the judgement of good design must incorporate limited identifiable functional criteria which may not reflect the complexity of a design world reality.

In the next sections the results are considered under these headings:

A. Computers as a means of representing designs (virtual reality, graphic materials)

B. Computers as a means for evaluating designs (using criteria built in to computer systems)

C. Computers as a means for generating designs (using computational design methods built into computer systems). The discussion will concentrate on the last heading.

6.1. Computers as a Means of Representing Designs (Virtual Reality, Graphic Materials)

In the graphic design field, computers have revolutionised the publications industry. The accurate representation of a designer's intention on screen has been recognised as a major advance in design technology. Designers can instantly manipulate images and see what the result will look like instead of having to wait for a printed result. The speed and accessibility of desk top publication has generated enormous popularity, especially in the graphics industry. This promises to improve with advances in CD ROM technology which provide useful vast storage capacities needed for desktop publishing and multimedia. High end colour printing has become a rarefied field as graphic designers fill their CD ROM computer systems with clip art and bezier-curve lineart collections. (Sudbury 1992) Rare demand for print quality beyond a standard desktop quality becomes gradually more expensive. Thus computers as a means of representing designs are able to satisfy a large

proportion of the graphic design industry today and appear to provide exciting future possibilities.

In other fields virtual reality promises to accurately represent design prototypes in their intended context. "You can reach out your virtual hand, and by running your fingers over an object, feel the surfaces and edges by means of the effectors that exert counterforces against your skin." (Rheingold 1992) Imagine the design possibilities: the experience of walking through the virtual reality prototype building or bridge; or perhaps the experience of a new label design that you can hold and use, or a useable light fixture in a virtual reality space which depicts the enduser's environment. Users of CAD may be the first to understand and develop new ways of designing with this 'electronic LSD' technology as it becomes effectively available. But as Rheingold suggests, "Yes, VR might become a key to open the doors of perception, but only if someone has the grace and good sense to design it properly."

Today's technology is very far from achieving such capabilities although computer war games have reached an extraordinary level of sophistication with the military simulation game called SIMNET, a project funded by the Defence Advanced Research Projects Agency, Seattle, USA. Two hundred tank simulators interact in real time. Predictions of mid-21st century technology achievements seem optimistic despite reports of VR machines in Australia. Martin Blackmore, director of Virtual Reality Corporation in Australia is reported to have brought out two virtual reality entertainment machines from W Industries company in the United Kingdom at a cost of approximately $100,000 each. (Humphreys 1992) .

Graphic and virtual reality systems rely on the user's interpretation of the illusions computers construct from their programs. Although improving, representations offered by illusionistic computer systems provide scope for inadequate understanding and judgement of designs. The complexity of the judgement of designs indicated by this study casts some doubt as to the accuracy of judgements made as a result of computer representations. For example, the recent unsatisfactory computer simulation of an American space capsule program proved to be inadequate and costly. A Channel Seven television news report showed the docking was unable to be completed as it was depicted in the computer simulation for the NASA Shuttle *Endeavour*, 14th May, 1992.

The descriptive qualities of computer representation have been well developed but how does this compare to the computers as a means of evaluating designs?

6.2. Computers as a Means for Evaluating Designs using Criteria Built into Computer Systems

Representing criteria for judging design quality within computer systems is fraught with difficulties. For example, this study indicated that designers are able to connote many nuances of meaning when using common terms to identify good design. "Communication" may need to be represented in many ways in a computer system to offer a satisfactory representation of a good

design quality. Similarly, research on visual perception has found form perception is a difficult problem due to the multiplicity of variables involved (Pomerantz 1986).

The use of computers to represent quantitative data seems to be most effective in relation to scientific studies which articulate the human judgement factor. However this study also indicates that the elucidation of the qualities of good design is problematic due to the imprecise nature of design language. The use of case-based reasoning to represent design experience attempts to represent "the explicit statements about design in terms of components and the relationships among the components" (Dongzhi and Gero 1991). The study shows that the extraction of explicit statements about the qualities of good design may be the first problem for any attempt to provide an accurate and efficient representation of good design.

On a social level, computer evaluation also seems to sometimes provoke uncertainty. For example, hospitals that have provided complex diagnostic systems often find the doctors are reluctant to use them. Expert systems such as the EEG analysis system use knowledge of an electroencephalographer to analyse electroencephalograms (EEGs) recorded from renal patients. On the basis of spectral features, the program classifies the EEG as either normal or abnormal (Smith 1990). The program uses rules with associated certainty factors as its knowledge base. It explains its results by displaying the outcomes of certain rules which are maintained and updated by system developers. Such a system for the evaluation of qualities of good design may prove inadequate due to designer's reluctance to accept a computer evaluation of a perceived abductive nature of design.

Evaluation is understood as the calculation of a value. Calculation may be descriptive or interpretive. If a description of a design is complete in terms of objects, properties, and relations relevant to the problem, AI advocates hold that questions can be answered by evaluation. For example, computers are able to evaluate whether an employee is older than his employer by comparing data stored in the files of the company. No deduction is required. However the simplicity of this example may be misleading. In the Powerhouse Museum, Sydney a computer was provided for the identification of teapots and other items in the collection by visitors. The individual spout, handle and body of various teapots could selected and combined from a variety of alternatives. When the result corresponded with the depicted collection item the participant is rewarded with some text explaining the significance of the object. This popular program provided a simple facility for the recognition of a correct solution but also allowed alternative solutions to be considered. In a sense, the program might generate new alternative prototypes using the 'incorrect' combinations. The 'correctness' evaluation is important here but the process may provide new alternatives in sympathy with human-computer interaction.

The calculation of value requires the interpretative articulation of criteria. Language is involved in the diagnosis of the objects, properties and relations of design. The task of distinguishing general attributes of excellent design correctly is often confounded by the nature of language and the complexity of

communication. Avram Noam Chomsky suggests that language makes the person rather than mankind making language. In linguistics the Chomskyan view is sometimes held, that the rapid and complex development of children's grammatical competence can be explained only on the hypothesis that they are born with an innate knowledge of at least some of the universal structural principles of human language (Chomsky 1976).

The concept of universal grammar is explained by Vivian Cook as, "'the system of principles, conditions, and rules that are elements or properties of all human languages . . . the essence of human language' (Chomsky, 1976, 29). UG is a theory of knowledge, not of behaviour; its concern is with the internal structure of the human mind. . . . UG theory holds that the speaker knows a set of principles that apply to all languages, and parameters that vary within clearly defined limits from one language to another." (Cook 1988). This theory appears to confound the task of distinguishing general attributes if one takes into account the literature which suggests the design process is too idiosyncratic to provide principles of any kind, for example, in architectural research on the design process (Buchanan 1990).

Nelson Baker notes that, "The presence of context and semantic information requires the most important assumption on the grammar used in the implementation; the grammar must be context-sensitive so that current information can influence the design decisions." (Baker 1989)

The context of the design seems to guide the value calculation. Thus the use of computers as a means of evaluation of designs depends on the quality of the examination of language use. Linguistic structure may be studied as a means of providing more accurate understandings of design contexts and semantics. The systemic grammar approach to an account of linguistic structure may provide useful directions for future study. According to Michael Halliday, originator of 'systemic grammar' the act of speech is viewed as simultaneous selection from among a large number of inter-related options. These options represent the 'meaning potential' of the language. If system networks representing these options are suitably combined and developed to enough detail, they provide a way of writing a generative grammar. This has been used in natural language programs in AI (Halliday 1978) Programs which provide semantic analysis of designer discourse promise assistance to research in this area. For example, *Nudist*, (Non-numerical Unstructured Data Indexing, Searching and Theorising), Latrobe University.

6.3. Computers as a Means for Generating Designs (Languages, Computational Design).

For twenty years or so, research in computational grammatical design has suggested that languages of good design may be constructed within computational domains. Schema or rule systems were proposed as a means of generating representations of design. For example, George Stiny sought to identify the character of design by using an approach which "sees designs in terms of how they are used, separating them from both process and products" (Stiny 1990). This approach distinguished the computational grammatical

metaphor from the traditional approaches to the definition and understanding of design. According to Stiny, the complexity of designs suggested a simple definition: *A design is an element in an n-ary relation among drawings, other kinds of descriptions, and correlative devices as needed.* To use this approach Stiny suggested the incorporation of a schema known as a shape grammar formalism (Stiny 1990).

Since the pioneering studies of Lionel March and George Stiny in the early 1970s (Newell and Simon 1972), the literature on the development of rule (principle)-based design systems has shown rapid growth (March and Stiny 1985). Apart from the well known architectural grammars such as Koning and Eizenberg's Lloyd Wright *Prairie-style* house (1981), Mitchell and Radford's *Eave* grammar (1986) and Flemming's *Queen Anne House* grammar (1987), other top-down grammars have been completed using well known graphic iconography. For example, Knight has investigated Constructivist and de Stijl imagery as a grammar (1983) and Makkuni has used traditional Asian iconography to construct a computational design grammar. (Makkuni 1986; Makkuni 1988; Stiny 1990)

However, the notion that designs and their meanings may be viewed as the results of computations carried out according to rules of composition and correlative rules of description has still to be significantly utilised in the design world. There has been a continued call for further research into the attributes of good design. From a review of material from cognitive psychology Purcell concluded that there is a, ". . . pressing need for research in the design area that identifies, for example, the ways in which we divide up the environment, that is the types of knowledge structures that develop to represent artefacts; the degree of connectedness between these areas; the parts and their attributes and ranges of values which form the basis for each knowledge structure; the relationships and their attributes and ranges of values that are important for "good" design to occur." (Purcell 1991)

The early promise of the use of computational grammatical design for the investigation of design and designing has not so far been successfully fulfilled according to Snodgrass and Coyne who comment on the need for further "understanding of how understanding arises". They suggest that this "involves a close examination of the part interpretation plays in the design process; how preconceptions function in the processes of selection and evaluation; how preconceptions lead to pre configurations of the design product; and how tacit experience and skills enter into the situation" (Coyne and Snodgrass 1991). The idealisation of design in models has been contrasted with the more nominalist character of recent philosophical discourse concerning design (Bernstein 1988). Concern for the "classical" models has been usurped by the assertion of multiplicity of meaning, or perhaps, an acknowledgment of "temporal distance". Bernstein quotes Hans-Georg Gadamer (*Truth and Method*, 281-282): "Temporal distance lets the true meaning of the object emerge fully. But the discovery of the true meaning of a text or a work of art is never finished; it is in fact an infinite process" (Bernstein 1988). Quantitative concepts of fuzzy logic (Coyne, Rosenman et al. 1990, 313-331) have not satisfied these criticisms of the

computational approach to design. The context of the classification of design qualities appears to confound progress despite the optimism of advocates of computational grammatical design (Woodbury 1991).

As an example I shall consider Mitchell's functional grammar. According to Mitchell humans tend to classify objects by function rather than form. As function may vary with context we must be prepared to reclassify "to recognise that 'this x will make a good y' if it is placed in a new context" (Mitchell 1990, 204). Mitchell used the example of Picasso's *Bull's Head* to show that the same items (vocabulary elements) might relate to different languages. As Mitchell suggests, the adjunctive term "good" can be applied only to nouns that denote classes of objects about which we can rationally have expectations,

> as to what instances will look like, or do, or be used for. Good is applied when our expectations are satisfied to a greater than usual degree. Thus a good circle is an unusually well formed one, a good knife is one that cuts unusually well: where types are characterised by form, good denotes well-formed-ness, and where types are characterised by function, good denotes superior performance (Mitchell 1990, 208).

According to Mitchell this is the basis of functionalist criticism. Mitchell shows how architectural vocabulary elements may be characterised both formally and functionally. Furthermore, he proposes that "a designer must be able to produce functional interpretations of designs and must check these against the functional requirements set out in the problem formulation." (Mitchell 1990, 209)

Using this framework as a guide, he proposes that the designers' identified qualities of design may be categorised in terms of their formal character. Functional grammars may be hypothesised by mapping the shape and form rather than meaning. The qualities of good design may only be interpreted in a functional grammar because their character may be identified in terms of their functional adequacy. Mitchell states, "A component of a system is functionally adequate if and only if its physical characteristics allow it to effectively perform its role within that system" (Mitchell 1990, 210). It follows that, in the case of a design exemplar the fundamental requirements of a design problem must be satisfied in a more than usual way.

The common qualities of design mentioned earlier such as functionality, appeal, timelessness, structure, and humanistic qualities may provide a basis for a generic grammar of good design across different fields if they are able to be understood in terms of functional grammars. The judgement of these aspects of a design exemplar raises the possibility that the following identified qualities are directly accountable to function:

> A: new dimension; green; structure; formative; clean; classical; Platonic; long lasting; purpose(ful); balance; harmony; open; innovative;
>
> B: reliable; comfortable; ergonomic; practical; automated; cost; efficient; manufacturability; colour combination; controllable; principles.
>
> C: informative; cost; innovative; position; focal point; unique; visual; strength; readable; communicative; reflective;

D: invisibility; functional; low key; interactive; multi-functional; tension; low maintenance; decorated; strength; simple; unassuming; plain; experimental; price; need (satisfaction of).

Mitchell believes that:

> Functional essences are established by the capacities of elements to perform actions and the designer's understanding of those actions as a means to serve architectural ends. Possible contexts, as expressed in syntactic rules, follow from conceptions of appropriate use and possibilities of physical fit. And conditions of functional adequacy can be established by observation and experiment.

Mitchell suggests that design rules are contingent upon the community of language users. It is how the designers apply and construct the rules that guide the practice (Mitchell 1990, 238). But the division of function and meaning remains problematic. For example, could the qualities identified in the study be developed into a functional grammar?

Elements in the above classification at a fundamental level were:

- purpose(ful)/need satisfaction
- long lasting/timeless
- innovative/new dimension

Qualities applied to particular contexts were:

- Material properties
- low maintenance
- strength
- readability
- greenness
- automated manufacturability
- ergonomic comfort
- cost efficiency
- interactive

Mitchell's design definition:

> Formally, design is execution of a computation in a shape algebra to produce required shape information, and the rules of a shape grammar specify how to carry out that computation.
>
> These rules encode knowledge of form, function, and the relationship of the two. Essentially, a designer knows that, by virtue of their characteristic shape and material properties, certain types of objects can appropriately be used for certain purposes by being placed in certain contexts. (Mitchell 1990, 238)

Mitchell believes a personal style develops and is essential. The findings of this study map on to Mitchell's view of design in several ways. Personal preference or style emerged from the study as a variety of aesthetic solutions were identified for different reasons by each designer. Further investigation may detect whether Mitchell is correct in asserting that critical reflection on the entailments of possible design responses gives significant design its exemplary quality.

Limitations of functional grammars appear to be their reliance on accurate identification of the context of the design. As the study indicated, designers were aware of the multiplicity of temporal contexts their designs were to serve. The satisfaction of a function ultimately seems reliant on the formal quality of the designer's judgement.

7. CONCLUSIONS

The Engineering domain appeared to allow the definition of qualities of good design more easily than the others. Generative/evaluative computer systems should concentrate on just some of these findings, eg "materials" because they may be more easily defined and identified. In general, good design emerges as context driven. The enduser, the "human' was generally at the forefront of the designer's considerations. Good design seems to rely on critical appraisals that contain both common and specialised characteristics. Common qualities of design are described in broad terms. By contrast, specialist qualities of design are described discreetly. In general, designers may agree on general principles outlined in engineering courses (Wray 1990) but their actual view of the world apparently differs from the tidy academic models.

On the one hand, different fields of design appear to have different understandings of the design process and good design. Apart from general humanist design purposes, the distinct aims of each field of design seem to inhibit inter-disciplinary understandings of good design. What is 'good' for one field of design may not be mapped on to other fields of design, that is, a designer may not apply the same criteria across different fields of design, perhaps because the aim or the context of the design appears to be conflicting. The apparent incongruity of criteria for good design across different fields of design confounds the idea of the generic design exemplar. It also seems to bring into question the utility of the fixed model of the design process or the paradigm design prototype.

On the other hand, the pilot study has provided enough evidence of the common use of some concepts of exemplary design to warrant further development of this research. Concepts of timelessness, simplicity, utility, humanity and elegance often are expressed in various ways when discussing exemplars of design with designers from different fields. Further work through qualitative research of designers' understandings of designing and design may provide a more substantial base for the development of theoretical understanding. The interpretation of the pilot study in terms of grammatical design suggests designers may be able to describe patterns of hierarchical decomposition (Meyer and Fenves 1992). All designers appeared to use larger conceptual metaphorical structures as the basis for their judgements of good design. Other aspects of grammatical design may need further investigation to confirm their relationships to the guiding design metaphors (Dik 1978).

Computers have the capacity to represent, evaluate and generate designs. But critical systems which may aid designers of generative systems depend on the discovery of idiosyncratic language patterns which disguise and convolute meaning. This is one of the reasons that assumption-based reasoning approaches to computational design systems are difficult to implement. The attempt to identify qualities of design which might be usefully employed in the construction of a design system requires a systematic analysis of both a designer's knowledge and experience. If one describes a design either from an internal or external viewpoint a limited computational design system results. Both the functional grammar of Mitchell and the visual virtual reality

design space of Woodbury are aware of this dilemma. The reconceptualisation of design as a topos of possibilities of human-computer interaction may overcome compartmentalisation of knowledge and experience.

Although consistent with some previous theoretical accounts of designing, the findings of this pilot study provide a starting point for further exploration perhaps with more designers on a larger scale. Other approaches to the investigation of the evaluation of design are possible. For example, the response of a designer to a particular object possibly provides a more focused investigation of these phenomena. Hypotheses concerning the relationship between various fields of design and the notion of good design need more rigorous development.

The ongoing impact of computers on the design world has been as profound as that of the 1457 Gutenberg/Fust printing press. It has promoted new commercial products and processes. Hopefully, increased use of multimedia and interactive software systems by the public may provide the platform for the development of more grammatical systems research. Rather than just entertaining ourselves to death with computers, the task of utilising experiential information by relating computers to designer's judgements of good design may foster further understanding of the design process and promote better design.

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Design Theory Hypermedia Studio

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Abstract This paper reports and demonstrates the value of the incorporation of digital archival material in design theory courses and outlines the general concept of a Design Theory Hypermedia Studio. A particular practical implementation of this concept, Design History Digital Archive Project, is described and analysed. This Project explores the incorporation of new digital technologies into the sphere of theoretical studies in design in existing design awards. The Project uses the following categories: philosophy, process, products, and influence on design history, as a basis for developing a hypermedia archive containing relevant images, clips, texts and sounds. Designers may be compared under these headings as a basis for further theoretical exploration. The Project aims to explore methods of development of design discourse which includes understanding of local and international design expertise. The Project's hypermedia archives are reproduced on CD_ROM discs to foster associative learning in open learning contexts. The notion of a Design Theory Hypermedia Studio drives theoretical issues further into the realm of praxis. Ecological and environmental issues underpin these developments and stimulate fresh insight into design endeavour. The development of digital information exchanges requires a redefining of the role of design educators.

1. BACKGROUND

The concept of a Design Theory Hypermedia Studio grew out of a need to develop an awareness of the past achievements in specialist design areas coupled with the mandate to acquaint students with significant contemporary issues in design theory. The quality of design discourse depends upon the critical and analytical skills of the designworld community. The Hypermedia Studio concept aims to facilitate that discourse by creating a digitised hypermedia archive embodying a significant and a representative sample of contemporary and past designers together with commentary about them and linkages between them. A specific implementation of the Hypermedia Studio concept

within the design awards at the University of South Australia is the Design History Digital Archive Project.

1.1. Context

The traditional understanding of design as an arts and crafts manual training has hindered the development of a design research discipline. The utility of the proposed project is that an appreciation for a vital research culture in design may be fostered within the undergraduate program. The Design History and Theory course has been operating within a limited timeslot on a conservative lecture/seminar basis. With limited resources many areas can not be covered adequately. Since the subject is in its infancy stage, the problem has been to develop interest and engender research skills in students who have a bias for practical skills.

Australian designers have traditionally not been known for their ability to talk or write about design. Design history in the current BDes course comprises 12% of the curriculum whilst in the UK it usually comprises 20% of the course. The introduction of computer technology has changed the role of designers from single-focused manual skills to multi-functional design managers. The introduction of hypermedia approaches in the creation of a digital archive overcomes past problems with the existing courses. These technologies allow designer related materials in text, image, sound and video to be brought together in a rich hypermedia archive immensely more accessible and more manipulable than the physical materials themselves. Such new technologies can foster new understandings of the importance of design, designing and design research. Access to archives of systematically presented and researched information would encourage the development of designers who are able to articulate their concerns in an historically informed and culturally significant manner.

The construction of a hypermedia shell has facilitated the presentation and storage of information which had been wasted in previous years of traditional design history and theory courses. The project envisages AARNET and interactive multimedia CD_ROM as the natural way to publish and disseminate the digital archive.

1.2. The Design Theory Hypermedia Studio Concept and the Digital Archive Project.

The concept of the Design Theory Hypermedia Studio embodies the following goals:

- to provide a means of recording contemporary design and designers.
- to use the information collected to create a comparative basis for design discourse.
- to foster analytical and critical thinking.
- to introduce digital information exchange as a critical tool.
- to develop an ongoing database for design scholars.

The vision of a dynamic discourse on design theory facilitated through a vast hypermedia digital archive of designers, rich in embedded associative links and diverse access metaphors drives the concept of the Hypermedia Studio. Its dissemination through AARNET and CD_ROM signal its national and international potential.

The implementation of the concept in the Digital Archive Project was introduced to students as follows:

> "Presentation: Design History Archive Project
> This is an experimental pioneering project which aims to utilise new technology in innovative ways to capture and use knowledge of design and designers. Students are to participate in research projects which will provide the basis for further archival development. The result will initially be a CD ROM disc which will be used as a reference tool for libraries and educational institutions. The project aims to develop a valuable resource which may expand in many directions as each generation of students contribute their research to the body of knowledge on the CD Rom. The tutorial presentation will incorporate text, slides, illustrations and video where appropriate in an interactive mode. The project aims to begin simply but themes such as Graphic Design, Contemporary Glass, Design Philosophy etc may emerge as the project develops. Thus it is envisaged that designs and designers may be compared on screen as never before in an associative learning environment.
>
> Requirements
> • Each student is to present a brief comparative study of three designers (two international and one local) using hypertext. Selection of at least one designer will be from a list provided by the lecturer. Each student is to present their electronic study in a seminar of approx. 20 minutes duration. Topics will be discussed and timeslots chosen in Week Two. Students are encouraged to use slides, illustrations, video to enhance their presentation.
> • Students must also submit a tutorial paper (on disc and also hard copy) of approximately 1200 words. Papers should be appropriately referenced and include a bibliography."

The project was to provide a positive experience which developed research and presentation skills and at the same time to facilitate a growth in the quantity and quality of design history discourse. Ultimately the project itself aimed to investigate, deliver, evaluate and report on the:

- development of a hypermedia based design history and theory course.
- conversion of existing physical archival resources to a digital form. Existing resources include some 10,000 slides, video clips, magazine and journal articles and course materials.
- development of a hypermedia presentation shell incorporating design exemplars, designers, design company case studies and associative hypertext links.
- production of distance education design history and theory materials on CD_ROM.

- production of training materials on CD_ROM to facilitate design studio education/practice.

2. THE DESIGN HISTORY DIGITAL ARCHIVE PROJECT

The Design History Digital Archive Project was initiated at the School of Design, University of South Australia in conjunction with the Centre For University Teaching and Learning. The establishment of a viable alternative to traditional academic approaches to theoretical studies was sought through a reappraisal of the methods of research and presentation of third year design students. It is recognised that change at this level may precipitate the alteration of other courses.

2.1. Staff

The staff for this project were brought together through the Centre for University Teaching and Learning. Dr Alan Barnes has been involved with the use of digital image data bases for many years and initially found the prospect of archiving over 10,000 images a challenge. Dean Bruton has been lecturing undergraduate students for five years at the School of Design, University of South Australia. The third year undergraduate course is called Aspects of Contemporary Design.

2.2. The Students

The size and composition of the third year undergraduate group determined the methodology to a large extent. The group consisted of 50 students from the departments of Graphic Design, Illustration/Ceramics and Glass. Two groups were formed and the timetable was designed to allow students to present on alternate weeks. many students needed intenses tutoring in computer skills in the initial setting up period. Each group was split into four sub-groups. This arrangement fostered group interaction and provided a manageable means of access to individual students.

2.3. Procedure

The approach planned for the project is based on established practice developed for hypermedia systems such as the "Virtual Museum", the "Comptons Multimedia Encyclopaedia" and previous work of one of the authors(Barnes 1992). In the project, images video and sound are digitised and together with text are incorporated into the multimedia presentation shell. The result is an individual student presentation linked to other presentations. A variety of access metaphors such as names, timelines, maps etc., allow consistent access to the collected presentations. Hypertext links deepen and enrich the interconnectivity between designers. Students were to identify exemplar images of their chosen designers, develop text commentaries and participate in the design of their presentations. The nature of the process develops alternative thinking strategies in conjunction with the design of the presentation.

2.4. Hardware and Software

The project used Macintosh computers and related software due to their acknowledged leadership in the multimedia area. Microsoft Word, Adobe Photoshop, and Quark XPress were used to prepare material for presentation through a Hypercard stack. Each presentation used scanned images which were handed to the liaison librarian and sent to Audio Visual Services for scanning and subsequently down loaded through the University computer network. Students were asked to provide images for scanning at least two weeks in advance. The librarian kept records of the images used by the students. The Hypercard application running on Macintoshes was used to create the shell although planning included eventual delivery under Windows 3 using Asymetrix Toolbook. The final student presentation used a portable Lite Pro colour projection unit.

2.5. Structure of Text

After the initial introduction to computer programs the students were given the task of editing material under the following headings:

- Brief Chronology
- Design Philosophy
- Design Process
- Design Product
- Influence on Design History

The division of information into these categories was to facilitate a comparison of designers and designs across the database. The collection of information, editing and designing of the presentation shell was done with Dr Alan Barnes during the initial stages. Students who were in the first group provided a model for the other groups.

Student's are encouraged to use research skills to collect original material using oral history and traditional research methods.

3. THEORETICAL FOUNDATIONS

Expert-system technology developed rapidly in the 1980s and this supported development of expert systems in specialised domains such as systems for configuring Vax Computers at Digital Equipment Corporation, designing paper feeders for photo copying equipment and architectural systems for specifying design and cost of simple timber deck construction. More recently hypertext and hypermedia approaches allow the simple embedding of associative and other linkges within a rich hypermedia database. Most recently the last of these media i.e. video, can potentially be incorporated with substantial guarantee of quality. All of the above would have little

impact were it not for the historical shift to ease of use computing. The design of effective human interfaces to computers (eg. the Mac), has so broadened the reach of computing that technical skills are becoming less important than critical, analytic and presentational skills. However the application of these technologies to the particular tasks of this project has never been undertaken before. The computer technologies may uniquely enhance the educational process where staff time is traditionally expended on the design development and documentation stages of teaching.

The first step in taking optimal advantage of computer technologies in the academic context is digitisation (Barnes and Christie 1991). Once digitised the material is in a flexible form that can be reorganised for a variety of teaching and learning purposes. It becomes incumbent on academics to take a strategic approach to the digitisation of their own intellectual capital.

Hypercard allows the student to build a module of design history or research into a predetermined format which may be used to relate information in a variety of ways. For example the philosophy or practice of several designers may be quickly found and compared. The system may be customised and expanded with other relevant programs. Development of modules of a specialist nature, say of design methods, designers' biographies, and company case studies would emerge from the broader themes.

3.1. Criteria for Change

Research into the nature of learning provides ample evidence that a learner's critical analysis is enriched through the reassemblage of information. However, the contingencies of values (Herrnstein Smith 1988) which pertain to the understanding of design history and theories often deny the traditional learner an understanding of the metacognitive strategies inherent in all design endeavour. Many universities are moving towards a digital approach to design education. (Goodwin 1992; Quinn 1992) The criteria used for a change in the approach to design history are based on this principle. The use of information in new and better structured forms facilitates innovative views of design problems and practice.

3.2. Environmental Context

The use of digital information exchange provides a valuable alternative to the traditional paper based culture in academic institutions. The ecological benefits of using a small amount of electricity must be weighed against the mountains of paper consumed by students each year in their paper presentations. The ecological benefits are compounded by the ease of transmission of information across all kinds of territory and distance. Paper also decays and burns whereas the electronic data remains intact

and also is able to be stored in less space. Electronic books also need to be designed. New understandings of visual communication are beginning to be realised. Students in the project showed a growing awarness of design issues in the human computer interface area. The learning environment of education has changed in keeping with the environmentally sound principles: reduce, reuse and recycle. (Fry 1993)

3.3. Archival Storage and Database

The important product of an interactive teaching resources or database is likely to develop new design roles.

> "We are likely to see library data base specialists who develop elements and details and so build intellectual capital; project specialists (who need knowledge and experience, but little in the way of traditional drawing skills) who make design decisions in particular contexts to generate the content of project databases; analysts who operate on developed project databases to produce engineering and cost analyses; production specialists (with graphic design skills) who format reports and organise document operations; data base managers responsible for organising and preserving the security and integrity of data; and project managers who thoroughly understand issues of systematically building a database, maintaining consistency, and appropriately organising reporting and updating. This redefinition of skills and roles is likely to be of comparable long-term significance to that which took place in the Italian Renaissance (and was exemplified in the career of Andrea Palladio), when the role of the architect who drew was separated from the role of the craftsman who built." (Mitchell and McCullough 1991, 381)

In keeping with Mitchell's prediction, the development of new roles for the design educator clearly emerged from the experiences with the hypermedia project.

3.4. Impact on student learning

General government support for use of digital technologies is evident in the support of distance education programs at Monash University with a $48 million dollar grant to develop their open learning units and CD technology. Monash plans to provide teaching material on disk for students to use in personal computers and study resources on CD_ROM. Further evidence of the growing adoption of computing technologies in teaching and learning is provided by the recent awards of the National Teaching Development Grants. Except for the successful programs at University of Technology, Sydney and at University of NSW the possibilities of uniting theory and practice through these technologies are yet to be taken up by design schools.

3.5. Monitoring and Evaluation

Evaluation of the effectiveness of utilising computer technology into the history and theory program will be monitored by anonymous bi-monthly evaluation questionnaires and discussions. Standard university questionnaires based on the work of David Boud have been used in the last three years of the course which may provide relevant

comparisons of progress. Student self assessment has been included as part of the programme. (Boud, Churches et al. 1986) The evaluation instrument will assess the extent to which a student's ability has:

- been stimulated and interested by the subject;
- developed comprehension of the subject;
- improved reading skills;
- improved research skills;
- improved evaluation and interpretation skills;
- developed confident computer skills.

4. OUTCOMES

Early indications are that the project has been well received by the majority of students. The project was introduced at the beginning of the semester some five weeks before the first presentations. Each group of approximately six students presented their material in a twenty minute period consisting of fifteen minutes for presentation and five minutes for discussion and evaluation. As students became aware of the possibilities offered by the medium a reflective practice appeared. The dialogue with the medium and the research empowered students to redesign their understanding. (Schön 1988)

4.1. Student Response

After some initial computer-phobic reluctance students in the first groups worked with a committed zeal on the project. Their enthusiasm for the approach was expressed after their presentation. A sense of discovery pervaded the presentations. Students were clearly excited about their topics and their findings. The format provided little time to elaborate upon their descriptions. The core ideas had to be expressed efficiently because of the restraints imposed by the medium and the timetable. Even though they had bemoaned their large workload, the presenter's clearly expressed delight with the learning they had accomplished about research, history, design and computation skills. Responses indicated that the electronic mode of presentation was superior to traditional forms of tutorial and seminar.

4.2. Student Assessment

Criteria for the student self assessment was agreed upon in general discussion. An assessment sheet was used which gave students the opportunity to grade the presentation and write a general comment. Students gave generous feedback to the "guinea pigs" in the first groups. The standard of presentation was novel and seemed

surprisingly effective. Comments made about the presentations on the evaluation sheets were often full of praise.

5. DISCUSSION

The development of design discourse may be facilitated by research of contemporary design and designers. Canons continue to foster a fixed view of the status of designers. (Livingston and Livingston 1992) The project encouraged the collection and use of original research material. The traditional use of secondary sources for design history was enhanced by the students' discovery that their decisions could shape their study and their understanding of history. (Putnam 1989) It was acknowledged that the historian had to make choices, often without full knowledge of the context of the decisions. (Margolin 1989) With issues of the nature of design history aside, the task of designing history became the focus. The use of history to inform theory depends on relative notions of theory. Broadbent has shown that theory may be understood as vague explanation or predictive hypothesis. (Broadbent 1979) The project initiated attempts to develop theories by elucidating principles for good design.

It was the use of the concise headings, the restriction of time and presentation space and the dynamic of discussion of personal findings that contributed to the perceived success of the first groups' presentations. The transition to digital design history was accomplished without many difficulties except those of a technical nature. Despite the inherent technical difficulties the Design History Digital Archive Project offered exciting potential for future development of design education. Design history remains a vital contribution for both education through design and education for design. (Praag 1992)

6. CONCLUSIONS

Archive projects have been used to document and report but little has been done to generate discourse through research into design. The potential of a design hypermedia studio is enormous, both in ecological and educational terms. The application of design knowledge to a variety of contexts through a database of designer's views allows hitherto unforeseen possible understandings of the conceptualisation and structuring of design knowledge. Through a comparison of philosophies, processes of design and products students are able to develop their own personal visions within a wider context than previously available. The interaction of students within the electronic presentation seminar may depend on the ability of the design shell to provide sufficient clues which interrupt any transfixation of attention. The novelty of computer presentation may wear

off in time but the information collected will continue to pass on a sense of history for generations.

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