

Working with unpredictability

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ABSTRACT

The paper deals with notions of complexity in art and architecture. On the basis of a recent sculptural work by Richard Serra, *Torqued Ellipses* (1997), the notion of complexity is investigated in terms of how it situates the viewer, and affects our sense of space and time. Serra's work is analyzed in terms of the artist's working method, the production of the work, and finally the "external relations" which connect it to the viewer and the context. In each of these steps, the notions of complexity and unpredictability are shown to have a formative role. The relations between space and time, object and context, are redefined in Serra's work, which also gives it great importance for architectural theory and practice.

INTRODUCTION

During recent years, complex systems and complexity in general have been widely discussed. Among abundant examples, we may find the special issue of *Architectural Design* on "New Science = New Architecture" (Nov. 1997), the creation of the Santa Fe Institute for Complex Science, and the new Masters Programme in Complex Theory at Michigan University. Theories of complex systems proliferated already in the beginning of the century, but now they have once more become a central topic, no doubt also because technical developments have provided us with tools to observe and analyze complexity.¹

The science of complexity criticizes reductionism, and instead opts for a holistic perspective, which means that objects and systems are conceived of as wholes not to be understood solely through a study of their constituent parts. How can we calculate dynamic processes giving rise to emergent qualities which cannot be predicted on the basis of parts? The theory of complexity finds itself in a situation where the outcome of a dynamic and complex system cannot be determined, since cause and effect no longer constitute a linear process—we have to deal with new and *unpredictable* results.

Herbert A Simon discusses the concept of unpredictability in economic theory and design theory, and he suggests that design implies a relation to the unpredictable. Now, this interest in the complex and unstable has made its way into architecture as

well. Stan Allen proposes that "acceptance of the real in its messiness and unpredictability" gives us a possibility to transgress the modernist aesthetic and ethic.² In his essay on "Bigness," Rem Koolhaas claims that "only bigness instigates the regime of complexity that mobilizes the full intelligence of architecture and its related fields," and goes on to say that "a paradox of Bigness is that in spite of the calculation that goes into planning, it is the one architecture that engineers the unpredictable."³

In the use of theories of complexity in architecture there is an implicit critique of a reductionist perspective perceived to have been predominant in modernism, and this often takes the form of a redefinition of architecture's engagement with the context. The environment becomes generative in the working process, like a variable in the making of the object, which also entails a redefinition of the relation between time, space, and body. These redefinitions take place across a wide spectrum of disciplines and practices, and here I will look a bit closer on some of them.

It is true that artists and architect work in different contexts, and yet they share some common questions. Here I will approach architecture indirectly, by investigating a contemporary sculptor, Richard Serra, and one of his recent works, *Torqued Ellipses*. *Torqued Ellipses* is a three-part installation (*Torqued Ellipse I*, 1996; *Torqued Ellipse II*, 1996; *Double Torqued Ellipse*, 1997), and was shown at the DIA Center for the Arts in New York September 25 1997 through June 14 1998. In the catalogue it is claimed that Serra's work not only is complicated and complex, but that it also deals with and discusses the concept of complexity. In his sculpture, he proposes a new understanding of space and time, and a possible encounter between a traditional Japanese and a modern conception of space, and in this he also problematizes the border between object and context, in order to find new connections

In the first part of this paper, I will discuss these *Torqued Ellipses*, beginning with (1) *the working method*, then moving on to (2) *the production method*, in order to see how Serra constructs his complex forms; finally I move on to the formal aspects of the objects and the ensuing relation to the beholder, which I call (3) *external relations*.

In the second part, I develop a reading of (1) the concept of *space*, and (2) the relation between *object and context*, in the light of the Japanese concept MA, organic space time, and minimal art.

Richard Serra: Torqued Ellipses

Richard Serra was born in San Francisco, 1939. He studied art at Yale University between 1961 and 1964, after which he travelled in Europe and Asia for two years before settling in New York where he still lives and works. He has become known primarily for his site-specific sculptures, and his research into the relation between object and context. The most famous example of this is of course *Tilted Arc*, a public sculpture at Federal Plaza in New York, which was subsequently removed in 1981, and has since been the subject of extended legal controversies.

Looking back from the vantage point of *Torqued Ellipses*, we find two earlier pieces, *Olson* (1985-86) and *Intersection* (1992), which already engage a spatial problematic intimately connected to the later work. Both of these earlier works consist of conic shapes whose top radius differs from the bottom one. In an interview,⁴ Serra relates how he became interested in the interstice or interspace resulting from the juxtaposition of the two sculptures in inverted position. An unstable room is created, with one wall leaning inwards and the other outwards. Serra talks about constructing a spatiality containing both of these movements, where both of the walls would be free to assume either inflexion.

In the beginning of the 90s, Serra visited Borromini's San Carlo Church (1662-1667) in Rome. Borromini's invention is, among other things, the "undulated" facade walls, which not only consist of one form but whose undulation seems shaped by interior and exterior forces alike. This is prolonged into the church's interior which contains forms bound together into an undulating surface. In this, Borromini is indeed an exponent of the Baroque, one of whose main interests was the constitution of "mobile" and dynamic spaces. In San Carlo the oval dome is the dominant element in the interior, and visiting the church gave Serra the idea to torque such an elliptic form. But how could this be done?

When Serra began working with *Torques Ellipses* he started off from spatiality and not from the object. He subverts the traditional hierarchy between sculpture and space by beginning with the construction of the interspace, and then by letting the object's form be decided by the requirements of this space. But starting with the interspace also has consequences for the object's contextual properties. *Torques Ellipses* is rather different than Serra's earlier work, especially the site-specific works from *Shift* (1972) and onwards, by not being tied to their context. This new position Serra understands as resulting from working from the inside and out. In the earlier works he started from the material, and space became a consequence, which for him means that the work began from without. In the new work he says that "I was starting with the void, that is, starting with the *space*, starting from the inside out, not the outside in, in order to find the skin."⁵

There is something paradoxical in the relation between the form as changeable and resisting legibility, in constant motion, and the demand for its determinability and measurability, in short: for the possibility of its construction. What is Serra's strategy for retaining the ambiguity in the form? I will look more in detail into how he works with complexity and indeterminacy as a variable in the different stages of the work: the working method, the production of the objects, and the beholder's perception of the objects.

The Working Method.

As already stated, Serra starts off with spatiality and not with materials. He begins by constructing the void, the torqued space. He builds the space as a positive form where spatiality itself becomes something material. He places two ellipses, made of thin plywood boards on top of each other, separated by a certain distance. The ellipses are then torqued in relation to each other. What Serra defines is the spatial position of two

ellipses, and between them he allows space to unfold. In this way he creates a space on the basis of a movement between two limit positions, a movement which subsequently will acquire material form and shape the torqued space. "I wasn't particularly concerned with what the skin looked like. The issue became how to relate the top and bottom ellipse to each other and how to rotate the void."⁶

Serra builds a very simple machine, consisting of a stick with two ellipses, torqued in relation to each other, placed at the ends of the stick (imagine a pair of highly warped wheels). The ellipses define two positions, and the stick the space in between. Then he rolls the "wheels" against a thin lead sheet so that they acquire a kind of metal "skin". The two positions are now connected with a form, the lead sheet, which in itself has no definition other than the one stemming from the limit positions. Serra replaces both aesthetics and visuality with motoric schemata and action in the genesis of form. "I wasn't interested in the aesthetics of these pieces, but in the fact that a generic form, an ellipse, could be torqued onto itself to produce a form not seen before."⁷

This new form was created as a relation between two given elements/positions. Serra claims that the knowledge of how the two ellipses were torqued has nothing to do with the content of the sculptures. The content is the movement between the defined positions and between the torqued skin, the lead sheets.

What is interesting about this method is how Serra defines two variables which then generate a whole form. By *relating two simple parts in a specific way they form a complex whole*. Serra defines only what is non-material, the void, and then allows the object to be produced without any aesthetic decisions being made. All aesthetic and artistic decisions were made in an earlier phase: "Once we started to use the wheel as a torquing device to generate the models, we realized that we were on to something."⁸

It is also worth noting that the form is generated from *lines* and not from planes. Serra proceeds directly from line to object, and he does not pass by the plane, which is otherwise often the case. Serra himself mentions that his way of dealing with the line is different than the traditional method of the architect. The use of computers also facilitates the use of the line as descriptive of space, since the existence of the line is the same as the definition of the spatial position of each of its (constitutive) points.

Production.

The objects produced by Serra's "machine" are however only models for the final works. His plan was to manufacture the final sculptures of two-inch thick steel plates, about 13 feet high and 29 feet long. Thus it was a question of gigantic objects to be made by continuous plates. The plates were to be compressed according to complicated measurements in order to have a differentiated thickness and in that way acquire a variegated, coherent and balanced form. Now, in what way did Serra represent his models before the production, and how was this complex surface made measurable and reproducible?

Serra eventually got into contact with Frank Gehry's engineer, Rick Smith, who had previously been in the aerospace industry, and asked him to help him out with the

construction. Smith provided him with a computer program, CATIA, which performed the same operations that Serra had done by hand. The difference was that the whole form was defined in the moment it was constructed. This possibility to "measure" an object which to us seems "illegible" was no longer necessary for the production of the full-scale object. But what is interesting is rather the avenues it opens for the production of complex forms.

CATIA produced the pattern of lines according to which the real steel plates were to be compressed, in order to create the torqued space and also attain balance and stability. After much work, Serra finally found a shipyard which could do the job. Finally the first form was ready, and in the catalogue he says: "When the pieces were erected on the floor, and I was first walked on them, I was as startled as anyone."⁹

We might here see the extent to which the computer facilitated the translation of the complex form from small to large scale. In small scale, Serra treated the complicated and not entirely predictable form by introducing a kind of *form generator*, where he himself defined a set of introductory parameters. You could say that the computer worked in the same way as his "device," with the difference that what is produced in the computer lacks scale and is abstract and defined in each of its points.

Through the computer, we no longer need to chart an entire form manually, but generation of form is the same as the definition of form. Today the architect and the artist need not be able to represent their works in order to have them realized, it suffices to be able to generate them. Instead of focusing on translation from one form of representation to another, *generative strategy* becomes important.

External relations.

Serra talks about the consequences his working method has for the final result, and I will now proceed with the discussion of *Torques Ellipses*, leading from the genesis of the work to its encounter with the environment. External relations is a concept I borrow from Bernard Tschumi, and he uses it in contradistinction to internal relations, which belong to the working process. Tschumi divides the external relations into what he calls the spatial sequence and the programmatic sequence. I see no reason to divide my discussion of *Torqued Ellipses* in two sequences, since the concept of program does not have the same relevance for art as it has for architecture. Nevertheless, I will briefly mention how Tschumi's concept can relate architecture, program, and sculpture. He proposes that each sequence gets its meaning through the relation space-event-movement, where program is the same as event. In the case of Serra, we have a space-time-movement, where the experience is the event in time, and where the spatial experience itself would constitute the program.

Serra placed his approximately 13 feet high sculptures in the exhibition space at DIA Center for the Arts. His torqued ellipses do not form closed objects, since they allow the visitor to move in and out of as well as between the forms. When the works are placed in a real space, we might talk about an encounter between two spaces. This

encounter in fact indicates our *incapacity to understand* the space in which we move. You see an object, and you step into it. What is strange, is that you are incapable of explaining the object inside which you move, you cannot intellectually describe the form. In this sense, Peter Eisenman talks about the split between understanding and experiencing.¹⁰ We are unable to survey the object from a position which would allow the form to be grasped, and the beholder is constantly caught inside or between the objects.

This warped spatiality, created inside the objects by the leaning walls and the torqued surfaces, also holds between the objects, where their respective outside surfaces give rise to new spaces, and erase the distinction between inside and outside. "Object" we often call something we can grasp as whole and coherent, what we understand as one thing, which renders the word unapt to describe these forms. Even in the final result, spatiality in Serra prevails over materiality. This non-object character gives rise to a disorientation, and it widens the *rift between experiencing and understanding*.

I would also like to stress another split occurring in the subject, a kind of "bodily schizophrenia." It is the very split of bodily understanding, which we as acting individuals use in our relation to external space, in order to orient ourselves, judge distances and sizes, in short: render form useful without having to pass any intellectual judgement on it or describe it accurately. Serra's sculpture ties the beholder, or the "experiencer," to the work by splitting the physical sensation or perception. The normal "whole" experience of the surrounding world is split into two separate phenomena, one *visual* and one *tactile*.

In its surfaces, the undulated walls, the form has certain curvatures which the eye reads as contours; it reads and follows these lines while the body's movements are determined by other qualities in the form – the split in our experience is in fact occasioned by the object itself. When a surface alters between concavity and convexity, certain maxima and minima are created, which in their turn form "ridges" and "valleys" readable as contour lines between various segments of the surface. The eye follows the contours, since this is how we read things in our environment, but in this case the contours are located within the object and dissolve its quality of "wholeness." The gaze is directed in ways different than those of the body, splitting perception in two parts, one *optic* and one *haptic* (from the Greek *hapto*, "to touch"), if we were to use the terms coined by the art historian Alois Riegl at the turn of the century.

Time-Space / Object-Context

As I have previously pointed out, both object and space are dependent on time and movement in order to be understood and experienced in Serra's sculptures. I will here discuss three perspectives on time-space and object-context; the Japanese concept of

MA, "organic time-space" in contemporary science (Serra in fact refers to the first but not the second), and finally minimal art, which is the immediate context out of which Serra's own work evolved.

In 1970, Serra spent six weeks in Kyoto, Japan, a formative period in his artistic development. There he discovered the Zen gardens belonging to the temples, and he experienced a way to approach space and movement which came to inflect his own: "My stay in Kyoto completely changed my ideas about sculpture," Serra claims.¹¹ He also describes the gardens in a way similar to *Torqued Ellipses*: "The primary characteristic of the gardens is that the paths around them and through them are curvilinear. The geometry of the sites prompted walking in arcs. The articulation of discrete elements within the field and the sense of the field as a whole emerged only by constant walking and looking."¹²

MA

In her well-known essay on the emergence of postmodern art, "Sculpture in the Expanded Field," the art historian Rosalind Krauss claims that Western culture has never been able to deal with the complex. Her main point here is how art has foreclosed both landscape and architecture. In Eastern culture, she claims, landscape and architecture, nature and culture, have been able to exist as a whole, for instance in the Japanese garden. In the same way that Japanese art and architecture would be different from its Western counterparts, so would our conceptions of space. Perhaps this is what Krauss implies: that our inability to think the complex has limited our capacity to experience space as well.

Since Descartes we have defined space and time as separate, homogeneous and infinite continua, a development already begun with the advent of central perspective and its mathematization and abstraction of space, which was removed from the sphere of bodily perception. If we compare The San Andrea Church in Mantua, designed by Alberti, and based on central perspective,¹³ with a Zen garden, we find two different types of spatial organization. The first has a rational structure that can be understood by a beholder from one spatial position. Thus there is a privileged position and a privileged sense, *sight*, and time does not affect our understanding of space.

The Zen garden is based on curves and its order does not reveal itself immediately. In order to understand the garden as a whole, one has to move past its minima and maxima, only then can the gaze extend in order to create a synthetic *experience of the whole*. Unlike the Western church, the Japanese garden requires of us that we move around if we are to grasp its unity. The Japanese conception of space is also a conception of time, and space is seen as a sequence of spaces extended over times. *Space occurs in time*, as a sequence of events, where spatiality itself becomes dynamic.

Organic space-time

The new sciences and their work on complexity has influenced Mae-Wan Ho to formulate another concept of time-space. He calls it *organic space-time*, and puts it against mechanical space-time. The difference is between a mechanical and an organic

system, and it is analogous to the distinction between the Western, Cartesian concepts of space and time, and the concept of MA. Organic time-space does not separate time from space, and it is non-linear, heterogeneous, and multi-dimensional. A mechanical system is an object *in* time and space, while an organic system is *of* time-space. An organism creates its own space-time through activities. Mae-Wan Ho claims that "in a way all developments in Western science since Descartes and Newton may be seen as a struggle to reclaim our intuitive, indigenous notions of organic space-time."¹⁴ This new definition of an organic space-time suggests a form that creates space in time, and the *form depends directly on the context*. Another interesting aspect of this concept is that organic space-time is fractal because it arises from natural processes, and a fractal form shows *self-similarity* or *unity with variety*.¹⁵

Minimalism

With Minimalism there occurred a displacement of interest from the object to the context, and a reformulation of a Cubist conception of space. Serra's own early works were done in the final phase of minimalism, as he arrived in New York in the late 60s. Earlier we claimed that Serra's work reformulates both the conception of space and the relation between object and context, and as we pass through minimalism we can see the connection between *time-space* and *place*.

Minimal artists opposed earlier forms of composition such as the adding of parts into a unity, where the internal relations between the parts carried the aesthetic interest. By working with wholes and "blank" surfaces without depth, they moved away from illusionism and internal relations, or rather: relations previously located between the different parts of the object were now projected outwards, to the space between object and surroundings. As Robert Morris claims: "Control is necessary if the variables of object, light, space, and body are to function. The object itself has not become less important. It has merely become less *self-important*."¹⁶ With minimalism object and beholder came to share the same spatiality, a field connecting the two poles.

Morris suggests a distinction between the *known constant* and the *experienced variables*. The known constant is the object, for instance the cube, simple enough to be immediately recognizable as form to the spectator. The experienced variables change as the spectator moves around in the room. Earlier we spoke about the split between understanding and experience in relation to Serra's *Torqued Ellipses*, where the experience related to *an absent understanding* of the form. In minimalism it is the other way around: "The constant shape of the cube held in the mind, but which the viewer never literally experiences, is an actuality against which the literal changing perspectives are related".¹⁷ Minimalism only allows the experience of the object to extend in time, while understanding remains as something direct and absolute. In the perspective of an organic time-space, where events define time and space, the minimalist field and its time-space are generated through the fleeting character of *experience* in relation to both object and context.

The constantly changing constant

Serra allows *both experience and understanding* to become variables in a timespan, which produces two parallel time-spaces, equal in priority since neither reason nor experience are constant. Serra moves one step beyond minimalism by splitting the experience itself in two parts, one haptic and one optic. Mae-Wan Ho speak of organic time-space as fractal, as a unity with variations. In *Torqued Ellipses* we find a fractal structure both in the *form itself*, the torqued surfaces, and in the *experience* of the form that breaks down in parts, one visual and one tactile, but in the same time exists as one whole experience. In comparison with the immediate priority accorded to reason by the minimalist object, Serra's object creates an uncertain and unstable environment where there is no stable constant (value) to cling to. The constant is, in the same way as the whole form, neither known nor absent. Time and the body's movements in space are what gives the object(s) their structure. The known constant has become a *constantly changing constant* dependent on the subject's perception. The understanding one has of *Torqued Ellipses* is more reminiscent of the Japanese garden as a *whole environment* than of the geometric understanding brought about by the minimalist object.

Serra's objects have a double relation to their context, both as a whole gestalt and as an environment. The constantly changing constant in relation to the subject is constituted by formal characteristics of the object, by the absence of an unambiguous whole gestalt. These forms seem at once autonomous and fully dissolved into their environment. From a formal point of view, the unitary object is broken up by the surface variations, the form as a whole displays a kind of self-similarity or unity with variety. Inside and outside seem to exchange their places, one object's outside becoming the inside of the interspace, and inversely.

The minimalist object left Cubism behind and stepped out into physical space, so that the beholder's movements became necessary for the experience, unlike the static viewer position demanded by the painting. Serra pries open the blank minimalist surface and lets the beholder quite literally into the object. By "cutting up" the "specific object" (to use Donald Judd's catchword) he creates a whole architectonic environment. Morris's known constant was based on an understanding of geometric shape from within the discipline of sculpture; Serras object's speak of an architectonic understanding where the subject's movements and experiences create an environmental understanding – an *architectonic understanding* no longer based on a geometric understanding of an object, but rather on an ability to find one's bearings and to experience a whole environment.

Intensive coherence

Cubism reevaluated Cartesian space by depicting things from several angles and perspectives at the same time, but also by showing how the experience differed from a geometric description. Cubism remained a metaphor, however, a representation of the new interpretation of space as dependent on both time and movement, and its illusionism was what made it into a representation. When the depth of surface and the

mobility of thought was superseded by real three-dimensional depth and corporeal movement in minimalism, *illusion was replaced by reality*. But this "real experience" was somehow dependent on a view of the world as consisting of geometric entities, the experienced variables depend on the known constant. Serra entirely departs from the idea of the known, and thus also from the idealization of reality, and he allows the objects to remain unknown and to only function within a real context. In this way, he can once more differentiate the surface and *reinsert internal relation* which, however, no longer form additions but rather merge into a fractal form, a unity with variety, without succumbing to illusionism. One could talk about a new type of internal relation, *intensive coherence*, both in the relations between the internal parts, and between part and whole, where each part relates to the whole gestalt. This double relation demands a fully real three-dimensional exploration to be understood.

Serra's Torqued Ellipses reevaluate the traditional relation between time and space by limiting understanding and experience to a real time-space. This also questions our preconceived notion of a duality between object and context, since the work lack a whole gestalt, and we as viewers tend to oscillate between between perceiving an autonomous object and a whole environment. We could say that the conceptual pairs space-time and object-context themselves express this intensive coherence.

Notes

¹Herbert A Simon, *The Sciences of the Artificial*, chap. 7.

²Stan Allen, "From Field to Object."

³Rem Koolhaas, "Bigness", *S, M, L, XL*.

⁴"Interview with Richard Serra," *Torqued Ellipses*.

⁵Ibid.

⁶Ibid

⁷Ibid.

⁸Ibid.

⁹Ibid.

¹⁰Peter Eisenman, "The Time of Serra's Space: Torquing Vision", 59.

¹¹"A Conversation Between M Taylor and R Serra," *Torqued Ellipses*.

¹²Interview with L Cooke, in R Serra, *Writings, Interviews*, 257 f.

¹³Siegfried Giedion, *Space, Time, and Architecture*, 30-38. Giedion suggests that the use of the barrel-vault is a consequence of perspective, since the former enhanced the perspective in a painting. According to Giedion, San Andrea was constructed after a painting by Masaccio, Fresco of Trinity (1425).

¹⁴Mae-Wan Ho, "The New Age of the Organism."

¹⁵Charles Jencks, "The Architecture of the Jumping Universe."

¹⁶Robert Morris, "Notes on Sculpture part 2," 17.

¹⁷Ibid, 16.

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