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Experience and Experiment in Art

The danger that lies in describing things as more simple than they really are is today often very overestimated. This danger does actually exist in the highest degree for the phenomenological investigation of sense impressions. These are always taken to be much simpler than they really are.

— Ludwig Wittgenstein (1964, p. 281). 1

To be an artist is not a matter of making paintings or objects at all. What we are really dealing with is our state of consciousness and the shape of our perception.

— Robert Irwin (1972a).²

A significant impediment to the study of perceptual consciousness is our dependence on simplistic ideas about what experience is like. This is a point that has been made by Wittgenstein, and by philosophers working in the Phenomenological Tradition, such as Husserl and Merleau-Ponty. Importantly, it is an observation that has been brought to the fore in recent discussions of consciousness among philosophers and cognitive scientists who have come to feel the need for a more rigorous phenomenology of experience. (See, for example, the papers collected in Varela & Shear, 1999; also Pessoa *et al.*, 1998; Noë *et al.*, 2000).

The central thought of this paper is that art can make a needed contribution to the study of perceptual consciousness. The work of some artists can teach us about perceptual consciousness by furnishing us with the opportunity to have a special kind of reflective experience. In this way, art can be a tool for phenomenological investigation.

The paper has three parts. First, I present what I call the problem of the transparency of experience. This is a problem for philosophy, for art, and for cognitive

^[1] My translation of the German original.

^[2] This passage is cited in the brochure accompanying Irwin's 1998 exhibition at the Dia Center for the Artsin New York entitled Part I: Prologue: x183, Part II: Excursus: Homage to the Square3, April 12, 1998–June 13, 1999. Elsewhere Irwin writes: 'The act of art has turned to a direct examination of our perceptual processes' (Irwin, 1972b). This is also cited in the same brochure.

science. Second, I present an alternative conception of experience as a mode of interactive engagement with the environment. Finally, against the background of this conception, I discuss, briefly, the work of the sculptors Richard Serra and Tony Smith.³

I: The Transparency of Perceptual Experience

Part of what makes perceptual consciousness so difficult to grasp, whether in science or art, is its transparency. We can illustrate this by means of a fable. Once upon a time there were artists who sought, in their art, to depict reality. For these 'realists', art was a way of investigating the world. Then someone noticed that knowledge of the world can be an obstacle to its successful depiction. What matters is not how the world is, but how it presents itself to us in experience. 'Free the eye from the dominion of the understanding' became the slogan of the new 'experientialist' artists who thus came to overthrow realism. But before long experientialism, in its turn, is thrown in to crisis. For to capture in a picture how the world presents itself to us in experience — to make a picture of how things truly appear — is just to make a picture of that which is experienced, of that which appears, namely the world. The subject matter of art-making, then, is not experience itself, but the experienced world, and so art must direct itself to the world. Experientialism in this way collapses back into realism and the struggle begins all over again. An oscillation ensues between realism and experientialism.

This fable is meant to get at the following idea. When we try to make perceptual experience itself the object of our reflection, we tend to see through it (so to speak) to the objects of experience. We encounter *what* is seen, not the qualities of the seeing itself. This idea was noticed by Grice, who wrote:

If we were asked to pay close attention, on a given occasion, to our seeing or feeling as distinct from what was being seen or felt, we should not know how to proceed; and the attempt to describe the differences between seeing and feeling seems to dissolve into a description of what we see and what we feel (1962, p. 144).

This is a familiar theme in philosophy. An accurate description of visual experience will confine itself to those objects whose presence is guaranteed by the experience itself, e.g. blobs of colour. Or so at least Hume (1740/1978), and philosophers working in his tradition, such as Price (1940) and Ayer (1973), have argued. When we talk of what we see (e.g. deer grazing on a lawn), we 'go beyond' what is strictly given to us in experience.

Kant (1787/1929) attacked this idea of Hume's and insisted that we falsify experience when we attempt to describe it in these supposedly neutral terms (as noticed by Strawson, 1979). I am not *more* faithful to my experience of the deer, but less, when I try to describe it in terms of my experience of brownish blobs on a green background. To be faithful to experience, I must talk about the way the

^[3] Images of works of Serra and Smith may be viewed at various sites on the internet. Interested readers may want to visit http://www.artcyclopedia.com/artists/smith_tony.html.



Figure 1 Mach (1886/1959). The visual field.

experience purports to represent the world (Strawson, 1979). To describe experience *is* to describe the experienced world. And so experience is, in this sense, transparent.

The transparency of experience, it should be clear, poses a problem for any attempt to make perceptual experience itself the object of investigation in the way that has interested philosophers. But it is important to recognize that this problem of transparency arises no less for the empirical (psychological, neuroscientific) study of consciousness.

Consider Ernst Mach's famous drawing (figure 1) of the visual field (Mach 1886/1959). The drawing is meant to serve as a representation not of the room, but of the visual experience itself, capturing on paper the distinctive character of visual awareness (as the artist sits with fixed monocular gaze looking out on his room). Notice that the drawing indicates the presence of the nose, moustache, belly, body at the periphery, that it represents the field as in sharp focus and uniform detail from the center out to the periphery, where things go indistinct.

Mach's drawing fails (as noticed by Wittgenstein). The picture does not capture what the visual field is like. It is true that the visual field is indistinct at the periphery. But the character of this indistinctness is not captured by the fade-to-white. That is, it doesn't seem to us as if the visual field fades to white at the edges. Consider also that the visual field is not in this way uniformly detailed and in sharp focus from the centre out to the periphery. You only see sharply that which you fixate, but you don't fixate such an expanse all at once.

Mach, it seems, misdescribes what it is like to see. At best, he succeeds in depicting his room. We see the familiar oscillation at work. He tries to direct himself to his experience, but, like the experientialists of the fable, he directs himself instead to the world. Experience, when thought of along these lines, is too transparent to capture in thought or on paper.

II: Experience as a Temporally Extended Pattern of Exploratory Activity

The puzzle of the transparency of experience results from thinking of experiences as like inner pictures and from thinking of reflection on experience as like turning one's gaze inward to those pictures. But this is a false characterization of experience. In experience we are aware not of inner pictures, but of the things around us in the environment.

To defend this claim, consider Mach's drawing again. We noticed that the drawing represents the visual field as too sharp throughout, as too defined, and that the characteristic indistinctness of the visual field at the periphery is not captured by the fade-to-white. We can summarize the picture's misrepresentation of experience as follows: the picture gives expression to the idea that when you see, you have all the environmental detail *in your consciousness at once*. Let's call this the 'details in the head' conception of perceptual (or visual) experience.

^[4] Wittgenstein remarked that Mach's drawings is one of the clearest examples of confusion between physical and phenomenological modes of description. Referring to the inadequacy of Mach's representation of the blurredness of the visual field by means of a different kind of blurredness in the drawing, Wittgenstein remarked: 'No, one cannot make a visible picture of the visual field' (1964, p. 267; my translation). See Thompson *et al.* (1999) for more on this. A point very similar to Wittgenstein's is made by Dennett (1991, p. 55), who writes: 'One can no more paint a realistic picture of visual phenomenology than of justice or melody or happiness'.

It is worth noticing that the 'details in the head' conception is, in fact, shared by many visual and perceptual theorists. Indeed, visual scientists have long tended to think of their central task as that of trying to determine how the brain give rises to richly detailed picture-like experiences of this sort, on the basis of the paltry information about the environment projected onto the retina.⁵

Consider an example from touch that illustrates this established problematic.⁶ Suppose you hold a bottle in your hands with your eyes shut. You feel it. You have the feeling of the presence of the whole bottle even though you only make finger-to-bottle contact at a few points. The standard account of this phenomenon proposes that the brain takes the little information it receives (at the isolated points of contact) and uses it to build up an internal model of the bottle (one capable of supporting the experience).

But consider: this positing of a process of construction of an internal representation may be an unnecessary shuffle. For the bottle is right there, in your hands, to be probed as occasion arises. Why should the brain build models of the environment if the environment is present and so can serve as its own model, as an external but accessible repository for information (as has been argued by Brooks, 1991; O'Regan, 1992)?

Recently a good deal of empirical support as been found for this 'world as its own model' view (e.g. work on change blindness (reviewed by Simons, 2000), inattentional blindness (Mack & Rock, 1998), animate vision (Ballard, 1991), and embodied cognition (Brooks, 1991). But anecdotal evidence will suffice to make us suspicious of the need for an internal model. Consider that we have all encountered the following familiar stunt. You are dining with a friend. You give a start and exclaim 'Hey isn't that so and so?' Your friend turns around. While she looks away you take a french fry. When she turns back, you shake your head and say that you must have been mistaken. She didn't see you take the fry. She doesn't notice that a fry is missing. Why does she fail to notice that the fry is missing? A number of candidate explanations suggest themselves. One such candidate is as follows: in examining her food she never built up a detailed internal model against which to compare her impression of the now altered pile of fries.

But there is a deeper problem with the 'details in the head' conception of experience. It is phenomenologically wrong-headed. (For more on this, see Noë *et al.*, 2000).

Consider the bottle again. It is quite true that you have a sense of the whole bottle as present in your grasp. But surely it does not seem to you as if, all at once,

^[5] Recently this consensus has begun to come undone. A group of new thinkers have come to endorse what I have called the new scepticism about visual experience (Noë, in press). Traditional scepticism about experience questions whether we can know, on the basis of experience, that things are as we experience them as being. The new scepticism, in contrast, questions whether we even have the experience we think we have. Whereas traditional visual science wondered how we can have such rich visual impressions on the basis of such impoverished retinal input, the new visual science that takes its start from the new scepticism targets a rather different question: why does it seem to us as if we see so much when, in fact, we see so little! The leading spokesperson for the new scepticism is Daniel Dennett. See Noë (in press) for extended discussion of this point.

^[6] This often used example is due to Donald MacKay (1962; 1967; 1973).

when you hold the bottle, you in fact make contact with each and every part of its surface! No. It seems to you, rather, as if the bottle is there in your hands and as if you have access to it by movements. You are, in fact, as a perceiver, master of the sensorimotor skills required to exploit such access. The basis, then, of the feeling of perceptual presence of the bottle is just this skill-based confidence that you can acquire the information at will by probing the world (O'Regan, 1992; O'Regan and Noë, under review).

And so for vision. When you see, you take yourself to be aware of a densely detailed world, to be sure. But you do not take yourself to have all that detail in consciousness all at once. The 'details in the head' model falsifies experience. Rather, you take yourself to have access to the detail by the flick of the eye or the turn of the head. The seeing, the experiencing of all that detail, is not something static, but something temporally extended and active.

The upshot of this discussion is that perceptual experience, in whatever sensory modality, is a temporally extended process of exploration of the environment on the part of an embodied animal. This is the key that unlocks the puzzle of transparency and so the problem of phenomenology. If perceptual experience is in fact a temporally extended process, then to investigate experience we need to turn our gaze not inward, but rather to the activity itself in which this temporally extended process consists, to the things we do as we explore the world.

III: Toward an Art of Experience

I have proposed that to investigate visual experience — that is, to do visual phenomenology — we must investigate the temporally extended pattern of exploratory activity in which seeing consists. I now propose that to study some works of art is to undertake precisely this sort of investigation. The study of such works of art can serve as a model of how to study experience and can also reveal how art can be, in the sense of Irwin's quote given at the outset, not only concerned with the making of objects, but more significantly with the investigation of perceptual consciousness.

I will focus on Richard Serra, whose work perfectly exemplifies the ideas I have in mind. However, there are and have been numerous other artists whose projects are *experiential* in the sense I have in mind (e.g. Smithson, Irwin, Turell, to name only three). What I shall argue is that Serra's work (and also the work of these other artists) enables us to catch ourselves in the act of perceiving and can allow us thus to catch hold of the fact that experience is not a passive interior state, but a mode of active engagement with the world. In this way, Serra brings to rest the troubling oscillation between experientialism and realism. 8

^[7] My use of the term 'experiential art' is similar to the use made by Rinder and Lakoff (1999) of the term 'consciousness art'.

^[8] Some readers might be struck by the fact that I now turn to sculpture after developing the to-be-criticized conception of experience with reference to a drawing of Mach's. Mach's drawing, I think, illustrates the problematic conception of experience that is my real object. It is not my intent, however, to suggest that there is an intrinsic connection between drawing as a medium and the problematic conception. For reasons that will, I hope, become clear, some sculpture provides an apt method

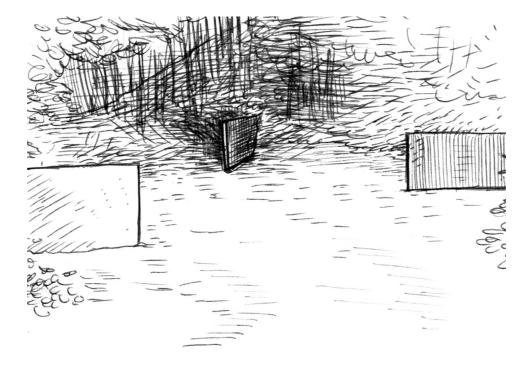


Figure 2
Richard Serra Spin Out: For Bob Smithson 1972–1973. Illustration by Miriam Dym.

Before turning to the work itself, let me be very clear about what I am doing and about what I am not doing. I am *not* arguing that the conception of experience I advocate fixes or solves any aesthetic problems. I argue, rather, that — against the background of this conception of experience — we can appreciate how Serra's work (and the work of others) helps clarify certain theoretical problems about consciousness. Now it might in fact be the case that the analysis here offered does in fact help to solve certain puzzles of an aesthetic nature about Serra's and Smith's work. If so, this remains secondary to the main purpose.

A final preliminary: I do not claim that the interpretation of Serra and Smith here offered is particularly original. Since developing these ideas I have learned that others — Rosalyn Kraus, Yve-Alain Bois, Hal Foster — have anticipated me

for investigating experience thought of as a form of activity. But it is no part of my purpose to suggest that picture-making cannot also perform this role. Cézanne is an excellent example of a painter who is, in my sense, an experiential artist. Merleau-Ponty (1948/1964) has made much the same point when he observed that Cézanne's is an art directed to the phenomenal which nevertheless avoids the 'ready-made alternatives' that preoccupied impressionism (e.g. 'sensation versus judgment', 'the painter who sees against the painter who thinks'). Merleau-Ponty emphasizes that although Cézanne remains faithful to the phenomenal, there is a clear sense in which he 'returns to the object'. He does so in a way, however, that allows him to discover a 'lived perspective' that is at once experiential and also directed to the world. Cézanne's pictures represent the environment as experienced. In this way, he is able to discharge the tension between experientialism and realism.

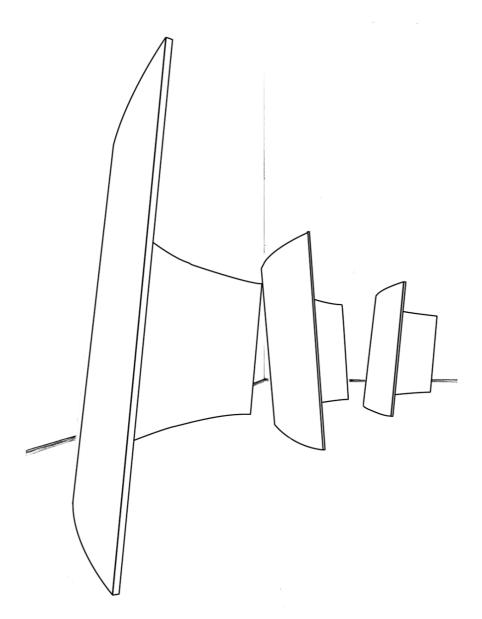


Figure 3 Richard Serra Running Arcs (For John Cage) 1992. Each plate is 13' $1^1/_2$ " x 55' $9^3/_8$ " x 2". Illustration by Miriam Dym.

in this or that respect. I am not, however, aware of anyone who has coordinated these various points in relation to philosophy and cognitive science in just the way I have attempted to do.

I turn now to the large-scale sculptures in metal that have been central to Serra's work since the 1970s. A striking example is *Spin Out: For Bob Smithson*, which consists of three large plates of steel (each ten feet by forty feet by one and

a half inches), each embedded into the earth along the side of a hill in a roughly circular array, as illustrated in figure 2.9

Let us note four characteristic features of Serra's sculptures. First, many of them are, as I will put it, *environmental*. That is, they are *intrinsically* sitespecific. What I mean by this is that the sculptures are not merely enhanced by their locations, but are made for their locations and are meant to become part of the environment. Some pieces (such as, for example, works in the recent *Torqued Ellipse* series) lack site-specificity, in so far as they can be moved from one site to another. But it would be a mistake to conclude from this that these works are not environmental. Crucially, these pieces are able to transform a location and so produce a new environment.

Second, like Borges' map of the world which is built on the same scale as the world itself, most of Serra's sculptures are *lacking in perspicuity*, that is, you cannot take one in at a glance. This has to do not only with their scale, but also with their complexity; to be understood they need to be explored.¹⁰

Third, a typical Serra sculpture, thanks to its scale, its surprising curves and apparent tilt, is overwhelming and disorienting, sometimes even frightening, almost always intimidating. It demands a reaction. Fourth, and as a consequence of the first three points, the pieces are, as I shall put it, particulars. By this I mean that they are unique, concrete entities. To encounter a Serra sculpture is to get to know an individual. The significance of this point will emerge in a moment.

With these features in mind — environmental character or site-specificity, lack of perspicuity, overwhelming scale, and particularity — we can start to lay out the method of phenomenological investigation deployed by the artist in these works. When one first encounters a piece, such as *Running Arcs (For John Cage)* (figure 3), one is liable to be struck by the scale and the visually inscrutable orientations and distributions of weight. One not only notices these qualities, but one is disturbed by them. One puzzles: what stops these giants from falling over? To wander around or through a piece such as this can cause a loss of balance. In this way the works make us reflect on how we *feel*, perceptually, in their presence. And they direct our attention to the complexity of our experience, a complexity we easily overlook. The loss of balance, for example, introduces us to what are strictly non-visual (e.g. vestibular, kinesthetic) components of our 'visual' experience.

If we press on and explore a piece by walking into or around it, we come to feel at ease in or near it. In this way, we gain a kind of practical knowledge. We gain knowledge about the spaces they occupy as places, or niches or environments.

^[9] In an interview, Serra described the piece as follows: 'The plates were laid out at twelve, four and eight o'clock in an elliptical valley, and the space in between forms an isosceles triangle, 152 feet on the long side, seventy-eight and seventy-eight feet on the legs. Each plate is ten feet high by forty feet long by 1½ inches thick hot-rolled steel sunk into the incline at an equal elevation' (1973, p. 16).

^[10] The aim of philosophy, Wittgenstein held, is the attainment of a 'perspicuous overview' (übersichtliche Darstellung) of a region of grammar or conceptual space. To gain such a perspicuous representation is to gain understanding and to see things aright. My use of the term 'perspicuity' is meant to invoke this idea. Serra's sculptures provide us opportunities to understand the environment we live in by exploring bits of it in order to attain a perspicuous overview where at first there is none.

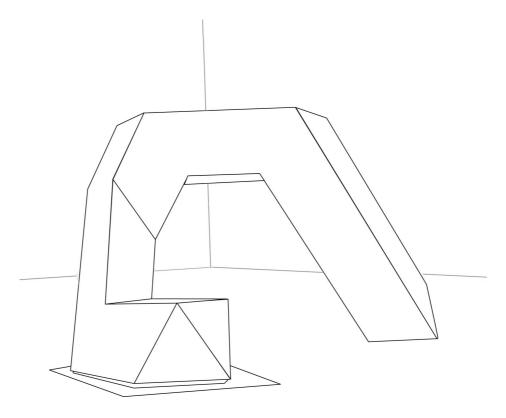


Figure 4
Tony Smith Cigarette 1961. Illustration by Miriam Dym.

The process of exploring the piece is a process of exploring the place. It is likewise a process by which we come to understand how experience can be, in this way, a form of openness to the environment. In light of the foregoing discussion of perceptual experience as a mode of active exploration of the world, it should be clear that the process of exploring the art work (and thus the environment in which it is situated), is at once a process of exploring one's experience of the world. And the knowledge one thus attains is knowledge of the character of one's experience.¹¹

In this way, Serra's work brings the oscillation between experientialism and realism to a halt. Perceptual experience is transparent to the world precisely

^[11] The dynamic character of the appreciation of the work of art is underscored by Serra in his discussions of the pieces. Consider further his remarks about Spin Out: 'First you see the plates as parallel; when you walk left, they move right. As you walk into them, they open up, and there's a certain kind of centrifugal push into the side of the hill. In fact the people at the Kröller-Müller wanted to call the piece "Centrifugaal" in Dutch. They talked a lot about vorticism. And then when you walk above it, there's another path which connects the two sides of the valley. . . . There's a ridge which encircles the whole space at about 150 feet. When you walk on the ridge, there's a contraction and the space becomes elliptically compartmentalized, which you can't see as you walk through it, and it's a different way of understanding your relation to the place: you're overhead looking down' (1973, p. 16).

because experience is an activity of engagement with the world. To attend to the exploration of the world is thus to attend to the quality of experience. We can think of Serra's work, and that of other experientialist artists, as providing opportunities for first-person phenomenological investigation.

Now there is of course a sense in which one could say of *any* object (and certainly any work of art) that it provides its viewer with an opportunity to reflect on what it is like to perceive it. What I am calling *experientialist art* is art that finds its home in this self-reflective moment. While just about anything can be made the occasion of such a self-reflective act, it is important to notice that not all forms of art and not all artists undertake their activity in this vicinity. We can deepen our grip on what distinguishes Serra's project *as experientialist*, by contrasting his works with those of a superficially similar, and no less important artist, the sculptor Tony Smith (see Figure 4).

There are similarities of scale and material in the work of Smith and Serra—each makes metal sculptures suitable for outdoor installation at least twice the height of a normal person. Smith's work, however, in contrast with Serra's, is utterly non-psychological. Where Serra's works are experimential, Smith's works are *geometrical* or *mathematical*. Smith's sculptures may be compared with what mathematicians call constructive existence proofs. A constructive existence proof demonstrates the existence of a mathematical entity by actually producing a relevant instance. Smith's constructions realize certain ways of combining shapes (e.g. tetrahedrons) in order to fill out space and so demonstrate that it is possible thus to fill out space. The space we learn about when we understand a Smith sculpture is not the space we experience. Rather, it is the objective, abstract space of mathematics.

It is this mathematical character of Smith's work that explains another important feature that places it in direct opposition to that of Serra. Serra's pieces are, as I've emphasized, particulars whose effectiveness depends on their environmental character, their scale and their complexity. They confront a person the way a steep incline on the way home from work confronts a person. In contrast, Smith's pieces are representative or universal. A crucial fact about a geometrical construction is that it instantiates in the particular what are in fact wholly universal relations. The particular triangle on which the geometer builds his or her construction stands for all triangles of the relevant kind (equilateral, say). Its particularity does not matter. It is irrelevant to the significance of the demonstration whether it is written in chalk on the board or on pencil and paper, or whether it is drawn to one scale or another. (This is a Kantian point. See Kant, 1787/1929, pp. 576–93.) In precisely this sense, Smith's sculptures have a kind of *immateriality*. That is, their material is immaterial. They are multiply-realizable, lending themselves to reproduction on different scales and out of different materials.¹² They lack site-specificity.¹³

^[12] The same cannot be said of Serra's work. Small-scale maquettes of the Torqued Ellipses utterly lack the aura of their full-scale counterparts.

^[13] It is interesting to note that if this reading of Smith is right, then Fried (1967/1998) was mistaken to select Smith as an example (indeed, as the example) of 'theatrical art'. Smith's works are self-standing

Serra once wrote that he is not interested in sculpture 'which is solely defined by its internal relationships' (Serra, 1973). Smith said in an interview: 'I don't make sculpture, I speculate in form' (Gossen, 1981, cited in Storr, 1998). These comments brings out the difference between their projects. Smith is concerned precisely with the sculpture of internal relationships, with geometry, with form. Serra's is a sculpture of consciousness.

Conclusion

My aim in this paper has been to propose that we can think of the work of certain artists (but not all) as providing methods for the study of experience. Serra's works, I have suggested, constitute experiments in a kind of phenomenological psychology. A Serra sculpture is an object for us to experience which functions to draw our attention to what we do when we experience it and to how things are with us perceptually. In doing so, I have suggested, the work enables us to appreciate that experience is a mode of direct contact with and exploration of the world. In this way, the works enable us to understand both how experience can be transparent and why its transparency is no obstacle to scientific, philosophical and artistic investigation of experience. Experience is transparent to the world because it is just a mode of active engagement with the world. A phenomenological study of experience is not an exercise in introspection, it is an act of attentiveness to what one does in exploring the world. To reflect on the character of experience, one must direct one's attention to the temporally extended, fully embodied, environmentally situated activity of exploration of the environment. Experiential art enables us to do this.

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wholes; they are concerned with the exploration of objective space (as it were) and not with provoking a reaction in a viewer. In contrast, I have been emphasizing ways in which Serra's work is theatrical. Serra's pieces perform their phenomenological function only as completed by the presence of a spectator. Indeed, Bois (1978, p. 52) has remarked that 'all of Serra's oeuvre is an implicit reply to Michael Fried's text' (cited in Taylor, 1997).

References

Bois, Y-A. (1978), 'A picturesque stroll around *Clara-Clara*', in *Richard Serra*, ed. E-G. Güse (New York: Rizzoli).

Ayer, A.J. (1973), The Central Questions of Philosophy (New York: Holt, Rinehart & Winston).

Ballard, D.H. (1991), 'Animate vision', Artificial Intelligence, 48, pp. 57-86.

Brooks, R. (1991), 'Intelligence without representation', Artificial Intelligence, 47, pp. 139-60.

Dennett, D.C. (1991), Consciousness Explained (Boston, MA: Little, Brown & Co.).

Fried, M. (1967/1998), 'Art and objecthood', in *Art and Objecthood*, ed. M. Fried (Chicago, IL: University of Chicago Press).

Gossen, E.C. (1981), 'Tony Smith: 1912-1980', Art in America, 69 (April), p. 11.

Grice, H.P. (1962), 'Some remarks about the senses', in *Analytical Philosophy*, ed. R.J. Butler (Oxford: Basil Blackwell).

Hume, D. (1740/1978), A Treatise of Human Nature: Analytical Index by L. A. Selby-Bigge, Second Edition (Oxford: Oxford University Press).

Irwin, R. (1972a), 'The state of the real. Part I. A conversation with Jan Butterfield', *Arts*, **46**, no. 10 (June). Irwin, R. (1972b), 'Reshaping the shape of things. Part 2', *Arts* **47**, no. 1 (September).

Kant, I. (1787/1929), Critique of Pure Reason, trans. Norman Kemp Smith (London: Macmillan).

Mach, E. (1886/1959), *The Analysis of Sensation*, trans. C.M. Williams (New York: Dover). Mack, A. & Rock, I. (1998), *Inattentional Blindness* (Cambridge, MA: The MIT Press).

Mackay, D.M. (1962), 'Theoretical models of space perception', in *Aspects of Theory of Artificial Intellegence*, ed. C.A. Muses (New York: Plenum Press).

Mackay, D.M. (1967), 'Ways of looking at perception', in *Models for the Perception of Speech and Visual Form*, ed. W. Wathen-Dunn (Cambridge, MA: The MIT Press).

Mackay, D.M. (1973), 'Visual stability and voluntary eye movements', in *Handbook of Sensory Physiology, Vol. VII/3A*, ed. R. Jung (Berlin: Springer).

Merleau-Ponty, M. (1948/1964), *Sense and Non-Sense*, trans. H.L. Dreyfus and P.A. Dreyfus (Chicago, IL: Northwestern University Press).

Noë, A., Pessoa, L. & Thompson, E. (2000), 'Beyond the grand illusion: what change blindness really teaches us about vision', *Visual Cognition*, 7 (1/2/3), pp. 93–106.

Noë, A. (in press), 'Experience and the active mind', Synthese.

O'Regan, J.K. (1992), 'Solving the "real" mysteries of visual perception: the world as an outside memory', *Canadian Journal of Psychology*, **46** (3), pp. 461–88.

O'Regan, J.K. & Noë, A. (under review), 'A sensorimotor account of vision and visual consciousness', *Behaviorial and Brain Sciences*.

Pessoa, L, Thompson, E. & Noë, A. (1998), 'Finding out about filling-in: a guide to perceptual completion for visual science and the philosophy of perception', *Behavioral and Brain Sciences*, **21** (6), pp. 723–802.

Price, H.H. (1940), Hume's Theory of the External World (Oxford: The Clarendon Press).

Rinder, L. & Lakoff, G. (1999), 'Consciousness art: attending to the quality of experience', in *Searchlight: Consciousness at the millennium*, ed. L. Rinder (New York: Thames & Hudson).

Serra, R. (1973), 'Document: Spin Out '72-'73: Interview by Liza Bear', *Arts Magazine*, April; reprinted in R. Serra's *Writings Interviews* (Chicago and London: University of Chicago Press, 1997).

Simons, D. (2000), 'Current approaches to change blindness', Visual Cognition, 7 (1/2/3), pp. 1–15.

Storr, R. (1998), 'A man of parts', in *Tony Smith: Architect, Painter, Sculptor*, ed. R. Storr (New York: The Museum of Modern Art).

Strawson, P.F. (1979), 'Perception and its objects', in *Perception and Identity: Essays Presented to A.J. Ayer with his Replies*, ed. G.A. MacDonald (Ithaca, NY: Cornell University Press).

Taylor, M.C. (1997), 'Learning curves', in *Richard Serra: Torqued Ellipses* (New York: Dia Center for the Arts).

Thompson, E., Noë, A. and Pessoa, L. (1999), 'Perceptual completion: A case study in phenomenology and cognitive science', in *Naturalizing Phenomenology: Issues in Contemporary Phenomenology and Cognitive Science*, ed. J. Petitot, J-M. Roy, B. Pachoud & F.J. Varela (Stanford, CA: Stanford University Press).

Varela, F.J. & Shear, J. (1999), *The View From Within: First-person approaches to the study of consciousness* (Exeter: Imprint Academic). Published as a special issue of *Journal of Consciousness Studies*, **6** (2–3).

Wittgenstein, L. (1964), Philosophische Bemerkungen (Oxford: Basil Blackwell).