

## **Art, Visual Perception and Ontology**

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### **[INTRODUCTION]**

Reading the call for papers for this conference, I was especially struck by the question:

### **[Question]**

'Do the operations of the human mind have something to teach us about the fundamental structure of reality?' This is the kind of question normally addressed by scientists and philosophers. I'm an artist rather than a scientist or philosopher, but nevertheless I hope to show that artists also have an interest in questions like this, and that they have something to contribute to current debates.

For obvious reasons, the nature of vision has been of great interest to artists, just as it has to scientists and philosophers. For centuries, artists have been exploring their own visual experiences and recording their findings in drawings, paintings, and sculptures, as well as discussing them and writing about them. The study of vision is particularly important for those who think about our relationship to the world, not only because it is a common area of concern across many disciplinary fields but also because it is widely accepted as the dominant means by which most of us come to know the world and our place in it. Current scientific thinking about visual experience tends to conform to what could be called the 'standard view' (SV), which has much in common with what the vision scientist Jan Koenderink has called the 'Standard Model.' SV can be summarized as follows:

### **[SV bullets]**

1. There is an external world full of objects and events with properties that exist independently of our perceiving them.
2. Our perceptual system creates an internal representation, or model, of objects and events in the external world, and it is this model we subjectively experience.
3. Our perceptual experience of the world is, therefore, distinct from the objects and events in the world itself.

Many vision science textbooks endorse SV by claiming the biological function of vision is to accurately represent or model reality, assuming there is a given state of reality to represent.

### **[Palmer and Frith quotes]**

In what is one of the most widely referenced textbooks on vision, Stephen Palmer states the evolutionary purpose of vision is achieving veridical knowledge of external objects and events, in order that perception is ‘...consistent with the actual state of affairs in the environment.’ Meanwhile the eminent neuropsychologist Chris Frith, writing about how the brain ‘creates our mental world’, says: ‘When I look at a tree in the garden, I don’t have the tree in my mind. What I have in my mind is a model (or representation) of the tree constructed by my brain.’ This standard view applies not only to the study of vision; it underpins a whole way of thinking about the existence of reality and our place within it. In other words, SV represents a set of ontological assumptions as well as a set of scientific ones.

Artists who have thought deeply about these questions have explicitly rejected SV, and the various ontological assumptions it entails. Georges Braque (1882-1963), the co-founder of Cubism who spent much of his life analyzing visual experience, said towards the end of his career:

**[Braque quote 1]**

‘You see, I have made a great discovery: I no longer believe in anything. Objects don’t exist for me except in so far as a rapport exists between them, and between them and myself.’ For Braque, objects in the world don’t exist independently of our seeing them; the object and our experience of the object are one in the same. He wrote:

**[Braque quote 2]**

‘A thing cannot be in two places at once. You can’t have it in your head and before your eyes.’

In this paper I will argue 1. SV misleads us about the relationship between the mind and the world and the way we perceive objects and events, and 2. the kind of view expressed by artists like Braque offers a preferable alternative. Drawing on ideas from art, science and philosophy I hope to show all these areas can be constructively combined to help further our understanding. I will address two issues central to my own artistic work, which also intersect with current areas of scientific interest: visual indeterminacy and depicting visual awareness.

**[VISUAL INDETERMINACY]**

It is an uncontroversial though still surprising fact about human vision that we do not ‘see’ objects or events in our visual field at all. We have known since at least the mid-nineteenth century, when the pioneer of vision science Hermann von Helmholtz conducted his seminal research, that eyes do not detect objects — or any of the properties we associate with them such as colour, texture, size, shape, or position — but only varying intensities and wavelengths of light. This fact has given rise to one of the

most difficult and persistent problems in vision science, referred to as the 'inverse problem'.

### **[Palmer inverse problem]**

The passage of light from environment to retina, via the lens of the eye, is relatively well understood. Less understood is how the viewing subject is able to create a useful image of the environment using only these variations in light as a source of information. This is because the light arriving at the eye is highly indeterminate with respect to the size, shape, position, or orientation of objects in the world; any point of light arriving at the retina could originate from a potentially infinite number of sources in the environment.

### **[Brain slide]**

Further along the visual system the signals generated by stimulation of the retina are processed by a number of specialized modules that mediate visual properties such as motion, colour, and orientation. According to some theories, the result of these processes is that in the early stages of visual perception we see an image composed of forms, lines, colours, motions, etc. but lacking specific meaning.

### **[Indeterminate picture]**

This image approximates how this early perceptual stage might be experienced. Most viewers on first being presented with this image see only an arrangement of dark and light patches without knowing what they depict. To enable recognition a further set of cognitive processes then link these shapes and patterns to semantic information — meanings, memories, concepts or knowledge — thus completing the perceptual process. Those who study visual perception and are interested in cases where it goes awry, like Martha Farah, have referred to these two distinct aspects as 'early' and 'high level' respectively. Visual agnosia is an unfortunate neurological condition in which the sufferer is able to 'see' quite clearly, i.e. their eyes and much of the visual brain remains in tact, but they lose the capacity to recognize what they see. Farah writes:

### **[Farah quote]**

'Visual form agnosia validates the distinction implicit in the labels "early" and "intermediate" vision, on the one hand, and "high-level," "object" vision on the other, by showing the first set of processes can continue to function when the second set is all but obliterated. It shows us a kind of richly elaborated but formless visual "stuff," from which "things" can be derived.'

Fortunately I don't suffer from visual agnosia, but I have experienced the kind of visual state that Farah describes, in which my high level object vi-

sion has become momentarily detached from my early vision with the result that I saw the 'richly elaborated but formless visual "stuff" that lacks specific recognizable objects. I have described this experience in detail elsewhere and so will only briefly mention it here. As a student I was watching the silent Expressionist film *The Cabinet of Dr Caligari*. Towards the end of the film, as one scene cut to another, I was struck by a momentary loss of meaning. I could see well enough (the picture on the screen had not been degraded) but I was no longer able to classify what I was looking at in terms of objects or events. Shortly thereafter the image changed and the meaning rapidly returned. Two stills from the film are shown here, the first being the point at which my comprehension failed and the second being the point where it returned.

### **[Caligari picture]**

I was later encouraged to learn that many artists have reported similar experiences, perhaps the most frequently cited being the case of Wassily Kandinsky (1866-1944) who is often (erroneously) credited as the first abstract painter.

### **[Kandinsky picture 1: Bavarian scene, 1908]**

### **[Kandinsky quote]**

He described returning to his studio one day at dusk to see an 'indescribably beautiful picture' made of only forms and colours in which objects as such could not be discerned. It turned out to be one of his own landscape paintings upside down, the subject of which he was momentarily unable to recognize.

### **[Kandinsky picture 2]**

Throughout art history, artists have been intrigued by the capacity of suggestive, indeterminate or ambiguous images to attract and hold the attention of an audience, and many artists have sought deliberately to create such images.

### **[Turner cartoon]**

One of the most notable is JMW Turner (1775-1851). Although regarded in his own time as one of the greatest British artists he was nevertheless subjected to vigorous criticism for producing paintings that many found too indistinct, sloppy or unreadable.

### **[Petworth painting]**

The subject of the painting formerly known as 'Interior at Petworth' but now titled *Interior of a Great House: The Drawing Room, East Cowes Castle* (1830, Tate Collection, London) has so long eluded art historians that its

title has changed several times over the years. Although the setting is clearly the interior of some large house, the many objects that populate the foreground have never conclusively been identified, and continue to this day to perplex even the most attentive viewer.

Ever since my experience as a student watching *The Cabinet of Dr Caligari* I have been trying in one way or another to replicate that visually indeterminate experience by making images that strongly suggest scenes and objects but at the same time defy recognition. Having experimented with photography, film, collage, drawing and computer graphics I eventually found I could create the desired effect most reliably in paint. For a period of about four years, from 2004 to 2008, I made a series of paintings that came as close as anything I had so far done to being visually indeterminate.

### **[My paintings]**

When exhibiting these paintings, and talking to people about them in the studio, I was able to consistently elicit reports from viewers indicating they were undergoing a visually indeterminate experience similar to that I described above. They talked of having the initial impression that the paintings were 'of something', perhaps a landscape, figure composition or still life in which they saw clues that suggested arms or bodies or buildings, but which on closer inspection turned out to be semantic dead-ends.

My ongoing research into the scientific background to visual indeterminacy led me to collaborate with two different groups of vision scientists, one at Max Planck Institute for Biological Cybernetics and the other at the University of Zürich. The purpose in both cases was to subject the viewers of my paintings to a series of psychophysical, behavioural and neurobiological tests in order to understand better their responses to visually indeterminate images. The Zürich team used behavioural and fMRI scanning methods to study the difference between subject's responses to my indeterminate paintings and similar looking paintings that contained recognizable objects. A typical pairing of such images can be seen here:

### **[Succulus and Michelangelo]**

One of the outcomes of this study was to identify a detectable 'indeterminacy effect' produced in the brains of subjects when looking at my paintings, described in the paper as the 'neural correlates of object indeterminacy'.

### **[Neural correlates]**

But one of the most surprising findings was the extent to which subjects reported seeing recognizable objects in images that ostensibly contained none. Despite my best efforts to remove any trace of identifiable forms, on

average subjects reported familiar objects up to 36% of the time (in some paintings objects were seen 52% of the time).

### **[Recognition statistics]**

Subjects were even prone to seeing objects 18% of the time in a set of entirely abstract paintings. The paper concluded:

### **[Ishai quote]**

‘Our findings indicate that this seemingly effortless process [of recognition] occurs not only with familiar objects, but also with indeterminate stimuli that do not contain real objects. It therefore seems that the primate brain is a compulsory object viewer, namely that it automatically segments indeterminate visual input into coherent images.’

### **[Picasso cubism no labels]**

It seems objects as such are not an intrinsic feature of visual information derived from the world; they have to be, as it were, ‘carved out’ from the mass of available data and cognitively imposed (no doubt using knowledge acquired through touch and bodily motion). Many artists have long recognized this, and exploited its effects to engage audiences with their work. This is especially evident in the paintings produced by Picasso and Braque during the so-called ‘analytic’ phase of Cubism, Here everyday scenes are constructed so as to provide the viewer with numerous clues about the identity of objects at the same time as denying full recognition.

### **[Picasso cubism with labels: The Dresser, 1910]**

This brief survey of visual indeterminacy in art and science shows that visually indeterminate images are a distinct class of images well known to artists, that they can have a specific and measurable effect on viewers, and that they will frequently be interpreted as containing objects that are not there.

A process we often assume happens automatically and accurately — i.e. the recognition of objects in the world — actually requires cognitive work and does not necessarily give us a veridical impression of the world. Taken together with the evidence from cases of visual agnosia, we can see how the normal visual system is continuously trying to segment and classify the indeterminate information within the ‘formless visual stuff’ created in the early stages of perception — a process that can be impaired by neurological damage or where images resist immediate interpretation.

### **[DEPICTING VISUAL AWARENESS]**

Just as we can be surprised to discover our eyes do not record objects, so many of us are unaware how much of the visual field is taken up by the

peripheral area of vision, and also how much is occupied by our own bodies. These features have tended to be overlooked by scientists and artists, but both are fundamental to our visual awareness and must be accounted for in any attempt to properly study it.

### **[Peripheral field image]**

Peripheral vision accounts for the majority of our visual field yet receives little attention in standard accounts of visual perception. References to it in some of the most widely used textbooks are cursory; Stephen Palmer's book contains no reference to peripheral vision in the index at all. Nevertheless some recent research is beginning to show that it is not merely an inferior version of central vision but has many unique and interesting properties.

### **[Peripheral vision illusion]**

#### **[Blurry peripheral vision]**

Despite what is widely reported, peripheral vision is not blurred. Rather, recent research has shown that the information we gain from these parts of the visual field is better described as 'locally disorderly' or 'textured.'

#### **[Koenderink blur image]**

The importance of this local disorder, according to Koenderink and van Doorn, is that it encodes information in a different way from blur. Disorder, or 'scramble', reduces the distinctness of an image but retains far more useful information about the scene than the equivalent blurring would do.

Only in the late-nineteenth century did artists begin to directly address the problem of how to depict the relative indistinctness of peripheral vision as compared with the point of fixation.

#### **[Cézanne and Van Gogh paintings]**

Interestingly, when artists like Paul Cézanne and Vincent Van Gogh attempted to depict the visual periphery they did so not with blurriness but by passages that became increasingly textured and indistinct moving away from the point of fixation, that is, by a kind of painterly scrambling. Surprisingly, few artists since have attempted anything similar.

Just as the effects of peripheral vision have been little studied in art or science, so has the appearance of our own bodies in our field of view. As the vision researcher JJ Gibson pointed out, our hands, arms, torsos, legs, feet and noses are almost always visible to us, though usually in the periphery. Given this, it is remarkable that we almost universally omit this feature of

visual experience when we come to represent it. In painting, cinema, photography, and computer graphics our images of the world are constructed as if we are looking through an unseen window or frame into the reality beyond.

### **[Chardin painting]**

Take, for example, a still life painting such as *Still Life with Attributes of the Arts* (1766, The Hermitage, St. Petersburg) by Chardin, one of the greatest painters in that genre. It is a highly detailed picture of a table covered in objects of various kinds, painted with enormous sensitivity and clarity. Chardin would have had in his field of view not only the objects he has depicted in the painting, but also his own hands, arms, nose, the rims of his glasses...

### **[Chardin self portrait]**

...the very painting he was working on with its easel support, and all the other paraphernalia of the painter. These objects would have occupied a substantial amount of his visual awareness. Yet, like nearly all other artists who have worked in the same way, he chose deliberately (or, more likely, in accordance with unspoken convention) to completely disregard them when meticulously recording what he saw.

### **[Vermeer painting: The Art of Painting, 1666, Vienna]**

### **[3D TV]**

In this regard at least, little has changed in imaging technology in the 250 years or so since Chardin was painting. The latest in 3D cinema, games and TV systems loudly proclaim their immersive realism and lifelikeness, yet they still lack any reference to the most compelling cue we have for our sense of immersion in the world, namely, the evidence of our bodies seen from our own point of view.

### **[Mach image]**

The earliest example I know of an image in which the subject's point of view incorporates their own body is the famous illustration Ernst Mach presented in his *Analysis of The Sensations* of 1886.

Gibson reproduces this illustration in his 1950 treatise on visual perception and includes his own 'updated' version.

### **[Gibson version]**

### **[Insert original sketches]**



(Note the return of the smoking hand, which Gibson was unlikely to have seen in the original sketch.)

As Gibson notes, the illustrations approximate what his and Mach's left eyes would see as they move around their respective rooms within the orbit of their sockets.

### **[Mach image]**

Although Mach's is a highly original image, it leaves something to be desired as a depiction of actual visual experience under these conditions, as does Gibson's, mainly because they fail to take account of the indistinctness of objects in the periphery. They assume, like many others have assumed, that we see all of the visual field with equal clarity. To assure yourself that we don't, close your right eye and notice how your nose and cheek appear quite fuzzy, even if you look at them directly.

Along with colleagues, I have been trying to depict my visual awareness as closely as possible in drawing, painting and digital media. Taking a cue from Mach's illustration, I made a painting on the iPad, which gives some impression of how the view from my left eye appears to me when fixating on my feet.

### **[iPad image]**

As will always be the case in any attempt to capture the dynamics of vision in a flat and static image there are deficiencies, notably the somewhat arbitrary boundary around the view. Like Mach and Gibson, I have struggled with how to represent this boundary, which by definition is something we don't see. But I believe there are also some improvements compared with Mach's and Gibson's versions. For one thing, the relative indistinctness or indeterminacy of objects in the peripheral field has been rendered using brushes that add texture to the forms, increasing towards the boundary. The focal variations behind and in front of the feet (taken from the eye line) are also depicted and the fuzziness of the nose on the extreme right, caused by its proximity to the eye, is emphasized.

[If you look up close you get a sense of being in the space]

All these visual cues help to direct the gaze towards the point of focus by creating spatial context similar to that experienced when fixating on the feet. Another feature that more closely resembles how we actually see is the diminishing size of the objects outside central vision. My feet are relatively large compared to their immediate surroundings since this is how they appear when I fixate on them. The fact that objects we attend to appear bigger has been noted by other artists (show illusion] while the fact that objects in the periphery get increasingly smaller as they recede from the point of fixation has been verified empirically.

These, and other features of vision, have been explored in a series of paintings in which I have experimented with different methods of rendering visual awareness.

### **[My paintings]**

In each case I have tried to capture as faithfully as possible the actual appearance of the scene before me when fixating on a particular object within it. One of the notable things about the resulting paintings is how they differ from conventional photographs of the same scenes. For one thing, the paintings use less pictorial space than the photograph to depict roughly the same amount of visual space, as can be seen in the example shown here:

### **[Photo comparison]**

For another, the paintings include various depth and occlusion cues that photographs can't capture, such as the 'doubling' of the plaster bust and picture frame behind the flowers when the flowers are the point of fixation. (See also Plummer for an account of the rather obscure twentieth century artist Evan Walters who also experimented extensively with 'double vision' in painting.)

### **[Evan Walters, John Bratby]**

### **[My paintings]**

These paintings are more than just attempts to more faithfully record visual awareness. By including parts of my own body in the image, and even the painting itself as it is being painted, I want to draw attention to the totality of our visual field and remind us that we are fundamental parts of reality, as are the tools through which we represent it. The long-neglected periphery, where our own bodies most frequently appear, is far more than an incidental detail of vision; it is the basic context within which all visual awareness occurs. I believe it makes little sense, therefore, to think about vision as a process through which we access a distinct external reality, as SV assumes. How could we be external to ourselves? What visual perception actually reveals, I suggest, is that our selves and the world are correlative parts of the same ontological domain. As Gibson puts it:

### **[Gibson quote]**

'...perceiving the environment includes the ego as part of the total process. In order to localize any object there must be a point of reference. An impression of 'there' implies an impression of 'here', and neither could exist without the other.'

### **[Erhsson images]**

It's interesting to note that recent research into size perception has shown that subjects presented with an illusion in which the size of their own body was radically changed, from abnormally large to abnormally small, made different judgments about the relative size of objects around them depending on the perceived size of their body. The researchers concluded:

**[Ehrsson quote]**

'Our results suggest that one's own body size serves as an approximate reference for the entire external world in view and not just within one's personal space.' A more general inference could be that one's own body, as perceived in the visual field, serves as a point of reference for the entire world precisely because it and subjective experience attached to it are parts of the world as an entirety.

**[CONCLUSION]**

The standard view of visual perception, embraced in many quarters of science, is one in which we as perceiving subjects observe external reality on the basis of internally generated representations. On this view, we never see the world, only its representation. It's as though we are watching a movie in our heads of what's going on outside using biological apparatus that has evolved to give ever-greater fidelity in terms of resolution, colour matching and object discrimination.

**[Movie in head images and movies]**

Even the most recent research into decoding imagery in the visual cortex of the brain is described by the team who conducted it in terms of the private cinema in the head:

**[Movie in head quotes]**

'We are opening a window into the movies in our minds'; 'Our natural visual experience is like watching a movie.' Yet the perennial problem, which Descartes was alert to in the 17th century, remains: i.e. if visual experience is like a movie in the mind then who's watching the movie? This merely perpetuates the long-standing homuncular fallacy.

**[Movie in head pic]**

I have tried to show here there are good reasons to doubt the validity of SV. First, the visual information we receive and process is inherently indeterminate with respect to objects and events in the world. Whether or not there are objects and events in the world with mind-independent determinate properties is ultimately a metaphysical question, but such properties are not detected in vision. Rather, visual information is subject to a process of selective differentiation upon which determinate categories are imposed that serve the biological imperatives of the perceiver. (Presuma-

bly, confronted by the same visual scene a human and a bee will categorize the light very differently). As Gibson put it:

**[Gibson quote]**

‘As things become identifiable, and as we learn to notice the differences between them, our perceptions of the world become differentiated. Formerly indefinite qualities become definite.’

Second, we delude ourselves if we imagine we can adopt an ‘objective’ or ‘God’s eye’ stance towards the world in which we ourselves are not ever-present and fundamental features. (Artists sometimes talk erroneously about ‘objective drawing’, as if it were possible to view the world ‘as it is’, without subjective distortion; scientists of consciousness, perhaps, hope that the scientific method can achieve the same.)

**[Image Durer]**

To judge by the fact that we habitually represent the world to ourselves in a way that entirely excludes our own presence, imposing an unseen window that separates us from the world, this is delusion that is deeply embedded in our culture and collective psyche. Visual experience, I suggest, cannot be properly understood on the basis of any fundamental distinction between our selves and the world. Once this distinction is removed we are in a far better position to deal with the complexities of the problem. As Jan Koenderink put it: ‘You *are* reality.’ Nor should we disregard the role peripheral vision plays in structuring our awareness of space and object proximity. I as have discovered in my own artistic work, rendering the indeterminacy of peripheral vision is extremely challenging, yet addressing this challenge is an area ripe for new research, and one in which artists and scientists could fruitfully collaborate.

The Standard View of visual perception reflects a widely held set of ontological assumptions concerning reality and our place in it. These assumptions apply not only when studying the nature of vision but the conscious mind as well, since visual experience is so central to conscious awareness. If it turns out that SV is invalid then so will be all the theories of consciousness that took it as a starting point — getting the basic ontology wrong will undermine any attempt to understand the nature of mind and reality. But if we get the basic ontology right, or improve it, then we are much better placed to know what to look for when conducting scientific experiments, to understand what we find, to ask the right sort of philosophical questions, and to obtain wider agreement on the answers..

In closing I’d like to revisit the statement from Braque quoted at the outset, which for me encapsulates in a brief sentence everything I’ve been trying to say so far.

**[Braque painting]**

If we look at one of Braque's late still life paintings such as *Studio V* (1949-50, Museum of Modern Art, New York), which represents a lifetime spent exploring the nature of visual experience, we can see in painted form what Braque was expressing verbally when he said:

'Objects don't exist for me except in so far as a rapport exists between them, and between them and myself'. It is an image full of indeterminate textures, forms, patterns, and visual relationships that require our active and prolonged co-operation as perceiving subjects if we are to see them as determinate things. The objects are 'there', but only because we are 'here'.

### [Comic images]

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