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## ABSTRACT

This article considers the phenomenon of visual indeterminacy, which occurs when the sensory data gathered from the visual system cannot be integrated with semantic knowledge. A number of examples are given, including from the author's own art work, and some results presented from a scientific study based on them. The implications for the operation of the mind and, in particular, the nature of aesthetic experience are addressed, and the distinction between the perception of visual forms and their cognitive interpretation is discussed. Arguments about the nature of aesthetic experience are then considered from some historical sources and interpreted in light of the distinctions between perception-cognition and form-content. The paper concludes by summarizing the links between aesthetic experience, the operation of visual perception, and visual indeterminacy.

## KEY WORDS

indeterminacy, formalism, painting, visual perception

### 1. Introduction

This article considers the phenomenon of visual indeterminacy that occurs when the sensory data gathered from the visual system cannot be integrated with semantic knowledge. It is a phenomenon that many of us have experienced at some time, although one that is little referenced in the psychological or neuroscientific literature. Yet I will argue that it points to a fundamental issue concerning our appreciation of art and, indeed, the very function of art itself. Furthermore, it may offer new insights into the workings of the brain and the mind, especially in relation to visual perception and aesthetic response. I will outline a number of ideas drawn from a range of different disciplines that collectively support this argument.

### 2. Visual Indeterminacy

It is probably most helpful to introduce the phenomenon of visual indeterminacy with an example.



Illustration 1. 'An Experiment on a Bird in the Air Pump' by Joseph Wright of Derby, 1768. Oil on canvas, 183 x 244 cm. The National Gallery, London. Image source: The Web Gallery of Art, [www.wga.hu](http://www.wga.hu), 2007.

Illustration 1 shows *Experiment on a Bird in the Air Pump*, an eighteenth-century British painting depicting the effects of oxygen withdrawal on a living bird by the use of a vacuum pump. The bird at the top of the painting in the vacuum jar is shown at the point of expiration, while in the foreground stands a flask shielding the candle that illuminates the whole scene. Inside this flask rests a silhouetted object, a specimen of doubtful identity. Amid all the precision and clarity of Wright's depiction sits this sinister form, all the more prominent for being dramatically backlit.

It is not at all clear what this shape represents. Is it a preserved bird, a dissected organ, or perhaps a skull? According to the National Gallery in London (to which the painting belongs) and several scholarly authorities, it is most likely the latter, but close inspection suggests this is by no means certain.<sup>[1]</sup> Its ambiguity cannot be attributed to the artist's shortcomings in rendering physical objects; his powers of accurate depiction are clearly evident in every other part of the image. Indeed, it is precisely because of these powers that viewers may be so perplexed by the vagueness of the amorphous shape in the fluid.

Visual indeterminacy then occurs when we are presented with images that are vivid and detailed yet resist easy or immediate identification, that is, when perceptual data cannot be integrated with cognitive data. There are numerous examples, not just in the history of art but in the most mundane aspects of everyday life.<sup>[2]</sup> Illustration 2 was recently added to a university bulletin board by a confused IT manager who wanted help in identifying what his Christmas-themed biscuit represented.<sup>[3]</sup>



Illustration 2. Image of an 'indeterminate biscuit' taken from University web site, which includes the caption: "What on Earth is this???? Found in a package of Cadbury's Festive Friends chocolate biscuits in the office this afternoon. What on earth is it supposed to be? Santa? Reindeer? Snowman????? Do tell if you know!"

The diversity of suggested meanings offered by respondents seems to confirm that the image on the biscuit is indeed highly indeterminate.

Those of us with healthy visual and perceptual systems are accustomed to rapidly identifying objects in the world around us, a process that normally occurs at such a speed (under 150 milliseconds) that we are almost never aware that it takes any time at all.<sup>[4]</sup> Yet on those occasions when these habitual processes stall or fail we may become acutely aware of the deficit and find our full attention drawn to an object or image that seems to defy recognition. It could be argued that at such moments our visual awareness of the world is intensified as we struggle to find extra clues that might resolve the discrepancy between what we see and what we understand. In the case of an innocuous biscuit, the heightened state of awareness might be little more than an aroused curiosity. But in the case of an unrecognized shape moving towards us, in some potentially hostile environment where our very survival might depend on correct identification, the degree of heightened awareness would be intense.

### 3. Indeterminate Art

For many years I have been intrigued by the occasional discrepancies between visual perception and semantic association, and have tried through a variety of media to replicate the phenomenon by making works of art. These now primarily consist of drawings and paintings, examples of which can be seen at my website. [\[5\]](#) In these images I have tried to create a visual field that is strongly suggestive of scenes and objects yet which consistently denies the viewer any opportunity to identify conclusively what they see. The main difficulty in producing such images is to correctly balance the amounts of suggestiveness and abstraction; if the forms are too similar, say, to body parts or vegetation, then the viewers are able to be reasonably confident about what they are seeing. On the other hand, if the forms are insufficiently suggestive, then the viewer will tend to dismiss them as abstract and meaningless and make no further inquiry. It has taken much experimentation with materials and techniques to arrive at a method that produces satisfactory, but by no means perfect, results. [\[6\]](#)



Illustration 3. *Paralysis*. Oil on panel, 27 x 33 cm, 2005. A painting by the author that suggests objects or scenes but resists easy or immediate identification. Robert Pepperell, 2006. Private collection.

The process of creating the indeterminate images normally starts by covering the canvas or panel with oil paint, more or less at random. It is important that both the consistency of the paint and the texture of the ground are correct, since much of the image is made by the technique of "wiping out." Here the paint is pulled from the surface to reveal the white background, and the interaction between the wiping tool (usually a finger), paint and surface gives the pictures their definition and tone. More often than not I have no idea at the outset what the final picture will look like. I work rapidly and almost absent-mindedly, moving paint around in a fairly haphazard way until a shape or pattern catches my eye, or an overall composition suggests itself. I have often wondered why one shape or design should stir my imagination and not another. After all, the paintings at this stage look like little more than oily smears. I have come to believe it results from a combination of two things. The first is the extraordinary capacity of the perceptual system to recognize objects from the most cursory of clues. The simplest arrangement of two dots and a line can put us immediately in mind of a face and, as noted above, it is clear that our visual systems are highly geared towards rapid and robust classification of external stimuli. The



second is the repository of pictorial prototypes stored in my memory, consisting in images of all kinds, but especially the countless paintings I have studied during my life. These are available to me with varying degrees of accessibility – some are easily recalled, others only dimly remembered. Sometimes I make a painting that only later I realize refers to an image I must have absorbed but don't consciously remember having seen. Illustration 3 bears a compositional resemblance to one of Rembrandt's last works, *The Conspiracy of the Batavians under Claudius Civilis* (1661-2, [National Museum of Sweden, Stockholm](#)), which I only realized sometime after completing the work.

Through a combination of nascent object suggestion and hints of pictorial templates, I lock on to particular areas of the painting that act as keystones from which other areas can take their reference, working them up until they start to evoke objects or scenes. It is important, though it may sound paradoxical, that the forms within the paintings have a realistic appearance, despite the purpose being to avoid meaningful recognition. This means ensuring the lighting, shadows, reflections, and highlights are consistent with a scene based on real space and contents so the viewers are encouraged in the conviction that they are looking at *something* visually meaningful even if they can't quite work out what. It is here that the indeterminacy effect can be at its strongest, when part of the perceptual system is seeing something ostensibly familiar and recognizable (i.e. a realistic-looking painting) while another part is struggling unsuccessfully to categorize the stimulus in a way that fulfills the expectations set up in the first place. To some extent this explains why many of the pictorial templates I use are based on classical paintings, such as those from the Baroque, Rococo, and Romantic periods. We expect such paintings to be highly recognizable from the objects they represent, if not necessarily from their allegorical or historical meaning, which induces the expectation that the image will be recognizable.

As noted already, the most difficult aspect of the process is achieving the delicate balance between suggestiveness and obfuscation. Too much of the first allows easy recognition (remembering how effective the visual system is at recognizing objects from very little information), and too much of the second discourages attempts to find meaningful content in the image, allowing the forms to be categorized as abstract shapes. Achieving the balance requires continual adjustment and readjustment, removing traces that are too explicit (legs, arms, and other body parts transpire all too easily) while elaborating on passages that seem too empty and formless. I have to be ruthless in erasing or transforming any object that too readily suggests a specific form. It is easy to become attached to certain objects that are visually pleasing from an artistic point of view but liable to be easily interpreted by an observer.

At the same time as dealing with the detailed forms, the compositional integrity of the painting as a whole has to be maintained – its global structure, the ratio of detail to expanse, the dynamics of spatial organization, etc. – without which the picture as whole loses any sense of coherence or unity. This is the most elusive, and usually frustrating, aspect for the work to achieve: to get it looking "right," and there are no clear or reliable guidelines for success. It is perfectly possible to have a painting in which many of the pictorial components are satisfying but where the image as a whole seems unbalanced, flat, wonky, or any other number of imprecise characterizations. All artists know the heartache involved in having to sacrifice a particularly pleasing passage or section in order that the overall image can be brought into balance.

How one knows when the painting is "right" is still a mystery to me, even though I make countless judgments about it on a daily basis in my own work and in teaching. Doubtless, the numerous pictorial templates one has stored away for reference form some sort of guide. And if one wishes to consult them, there are myriad theoretical treatises to be found on the subject, from gestalt psychology to design theory, that offer prototypes and formulae for creating compositional harmony. Unfortunately, in my own experience few of them are of much practical use to the artist who wants to avoid hackneyed and obvious compositional structures. In any case, each painting presents its own unique organizational problems to solve and generic advice is of limited value. What is crucial here as far as creating visually indeterminate images is concerned is that the final painting must convince the viewer of its pictorial integrity at every level, from the handling of the paint and the suggestiveness of individual forms to the overall compositional coherence. Deficiency at any level will reduce the indeterminacy effect and so invalidate the work.

Through showing the paintings in private and public in recent years, I have accumulated much anecdotal evidence through verbal reports that they succeed in evoking the intended effect on the viewer. That is, viewers report that they undertake multiple visual searches to clarify what they think is suggested by the images but are

continually unable to do so, being forced time and again to reset their semantic assumptions and try out new hypotheses. Viewers often report also that they regard the images as having a high level of aesthetic impact, using terms like 'beautiful,' 'engrossing,' 'enigmatic,' etc., although it does have to be said that a fair proportion also find them unsettling, even disturbing, especially if the forms are suggestive of body parts or sexual activity. It's also worth noting that monochromatic images tend to more indeterminately effective than color.

#### 4. A Behavioral Study of Visual Indeterminacy

Valuable as such informal reports are for gauging the reactions of viewers to art works, I became curious to find out whether scientific methods could offer a more objective way of measuring the effects of my own indeterminate images, especially when compared with images that were visually similar yet full of recognizable objects. I was fortunate to meet an eminent neuroscientist, Professor Alumi Ishai, of the University of Zurich, who had an interest in art and visual perception and undertook a series of experiments in which a set of my paintings was presented alongside a set of recognizable paintings by old masters. [7] The subjects in the experiments were asked to perform a number of tasks, including deciding whether each image contained a familiar object (a measure of object recognition) and how powerfully the images affected them (a measure of aesthetic response). Details on the experiments and the results can be seen in the paper cited, but for the purposes of this article I wish to note one of the surprising findings of the experiments: that subjects gave almost identical scores for aesthetic affect across all the paintings in the study, regardless of how recognizable they were. [8] What this seems to indicate is that, in rating their aesthetic response, the subjects were less influenced by the literal meaning of the images they saw than the immediate visual impact of the shapes, colors and composition.

In art historical terms, the distinction between the meaning of an art work and its physical appearance has been understood in terms of 'content' and 'form,' and this distinction has given rise to prolonged and often impassioned debate among theorists of art and aesthetics as to which aspect is the more significant in determining the effect of an art work and, indeed, whether the two aspects can really be distinguished at all. [9] What the study cited above suggests is that the distinction does have some validity, certainly when measured in terms of behavioral response to images that are either indeterminate or recognizable. The study also shows that subjects were significantly slower to make judgments about indeterminate paintings than they were about the recognizable ones, which might suggest that the attempt to find objects in the indeterminate images requires a different kind or greater degree of underlying cognitive processing than when perceiving recognizable images. Crucially, though, there was a significant correlation between length of time taken to determine whether or not images contained objects and rating of aesthetic effect, such that the longer it took to make a decision, the more powerful the image was thought to be.

It is worth elaborating on the fact that the rating of aesthetic effect employed in the study differed from that used in most studies of this type. Rather than using a rating of "ugly to beautiful," as is often the case, we used one of "powerful affect" on a scale of 1-4, with 4 being the most powerful. The reason was that, as even a cursory glance at art history will show, the aesthetic impact of a work of art is not necessarily linked to how beautiful, pleasurable, harmonious, or pleasant it is. As I know from my own experience, some of the most impressive art works can be quite ugly, disturbing, distorted, or dissonant. One thinks immediately of Goya's *Saturn Devouring his Son* (1823, Prado, Spain), Picasso's *Mother and Child* (1907, Musée Picasso, Paris), or the Chapman brother's *Hell* (1999-2000, Saatchi Collection, London). The use of the term 'powerful' is arguably more neutral and therefore more objective as a indication of how a work of art is affecting a viewer than the more limited category of beauty. To summarize, then, it appears from the study that increased recognition latencies are associated with an increase in the "powerfulness" rating of the image.

Although many firm deductions cannot be drawn from one study, I wish to argue that the experiments described above, coupled with the subjective reports gathered from viewers, indicate that something is happening in the case of viewing indeterminate art works that isn't happening with immediately recognizable ones. My own experiences of seeing indeterminate images, whether art works or not, I know to be moments of great vividness and highly focused attention, where the habitual operations of recognition are fleetingly suspended as the mind struggles to resolve the components of the spectre into something meaningful. [10] This is not always a straightforwardly pleasurable experience; it can sometimes be quite frustrating or disorienting, and not immediately rewarding. For my part, however, the experience is of great value, since

for a few moments I am acutely aware of the pure visual form of the scene before me in a way that I am not when perception is semantically determined.

## 5. Aesthetics and Indeterminacy

Although it may be familiar territory for some readers, it helps to put the subject of perceptual or cognitive indeterminacy in a wider historical context, in order to mention some references in aesthetic theory and art history to moments when the viewer or reader must attempt to recover meaning through highly focused attention. Victor Shklovsky, writing in 1917, proposed a theory of art in which its function is to resist what he calls our perceptual habitualization, whereby we become unconsciously accustomed to using an algebraic shorthand for objects in the world for reasons of economy of effort. The consequence is that we then perceive the world as though it were in itself made of these abbreviated symbols and remain oblivious to the fabric of the world in itself. The purpose of art, according then to Shklovsky, is to defamiliarize our perceptions of the world:

The technique of art is to make objects 'unfamiliar,' to make forms difficult, to increase the difficulty and length of perception because the process of perception is an aesthetic end in itself and must be prolonged. In art it is our experience of the process of construction that counts, not the finished product.[\[11\]](#)

Although in his essay Shklovsky is primarily referring to literature, the aesthetic function he describes could just as well be applied in the case of the visual arts, and painting in particular. Looking at a painting is a special act of seeing, carrying with it certain expectations and implications, one being that the painting will be of something, that is, it will represent something other than itself. Of course not all paintings are representational in the conventional sense, although one would be hard pressed to come up with an example of a painting that has no referent at all.[\[12\]](#) But in reading the content of a representational work of art, we will find the artist has been more or less explicit about what is depicted, with the consequence that more or less effort will be required to recognize what the painting is of.

An artist who was highly evocative in his depictions of the natural world and who suffered sustained and virulent criticism, yet who inspired many later significant artists was J. M. W. Turner (1775-1851). His imaginative translations of atmospheric weather conditions, mysterious interiors, semi-mystical biblical, mythological, and historical scenes contain in many cases unprecedented degrees of visual indeterminacy, for which he was frequently attacked in his own time. Contemporary critics were often affronted by the additional demands that indeterminate paintings made on their perceptual apparatus, and the rather conventional portrait artist John Hoppner was to complain in 1804 about Turner's work that:

so much was left to be *imagined* that it was like looking into a coal fire, or upon an Old Wall, where from many varying and undefined forms the fancy was to be employed in conceiving things.[\[13\]](#)

The fact that such demands made on the imagination are seen as a deficiency tells us more about the contemporary expectations surrounding the viewing of paintings than it does about Turner's works themselves. To the modern eye, the looseness and vigor of Turner's natural descriptions are more likely to be favorably received. Indeed, the Clore Gallery at Tate Britain regularly exhibits Turner's late, unfinished preparatory grounds, in which it is very difficult to discern any objects, as pictures in their own right, something that would have seemed quite bizarre to his contemporaries and most likely to the artist himself. This tends to imply that we now value the indistinctness as a positive aesthetic quality in these works, rather than a deficiency.

The indistinctness that seemed to mar Turner's images in the early 19th century was to inspire a later generation of artists, particularly French, to represent the natural world with even greater imprecision. Those artists, including Sisley and Monet, who visited London and its galleries in the 1870s and were deeply struck by Turner's methods, were to evolve a means of rendering nature that provoked similar public scorn because they allowed the boundaries of discrete objects, such as trees in an landscape, to dissolve into their immediate surroundings, in some cases losing their identity almost completely (see Monet's *Morning on the Seine* series of the late-1890s).

So it was that at the end of the 19th century, when the impact of Impressionist methods had contributed to reshaping the intellectual and artistic climate of France, the poet Stéphane Mallarmé was able to argue:

To name an object is to suppress three-quarters of the enjoyment of the poem, which derives from the pleasure of step-by-step discovery; to suggest, that is the dream. It is the perfect use of this mystery that constitutes the symbol: to evoke an object little by little, so as to bring to light a state of the soul or, inversely, to choose an object and bring out of it a state of the soul through a series of unravelings . . . There must always be enigma in poetry, and the goal of literature - there is no other - is to evoke objects . . . [14]

Indeterminate images, as described here, would seem to fulfill both Mallarmé's and Shklovsky's criteria for aesthetic efficacy insofar as they are enigmatic and evocative to the imagination, as evidenced by subjective reports of viewers when seeing them, and at the same time difficult to decipher, so lengthening the process of perception (as suggested by the longer reaction times to indeterminate images in the behavioral study cited above). In terms of the functioning of the mind, both Mallarmé and Shklovsky call for a suspension of those customary or facile modes of perception where we are either oblivious to the raw perceptual qualities of the world or offered representations that leave no room for imaginative interpretation. Instead, they each urge that the habitual link between perception and cognition be loosened or broken in order to raise the aesthetic value of our experience.

## 6. Summary

There is a strong correspondence, if not exact equivalence, among the broad distinctions between "perception-cognition" and "form-content," and similarities in the way they are thought to relate to each other in the operation of the mind in general and aesthetic experience in particular. The purpose of this article has been to briefly outline these correspondences and establish an argument that in summary is this: Normal visual experience consists in at least two functions that are complementary but nevertheless dissociable. The first is the presentation of stimuli as forms devoid of precise and consciously apprehended meaning, and the second is the classification of those forms into semantically significant units, or concepts, that are understood. Indeterminate images resist precise or immediate codification and so force the focus of attention upon the more formal properties of the visual stimuli while an intensive search for new hypotheses to fit the pictorial facts is undertaken. This has the effect of slowing down or suspending the normal operations of visual recognition. However, in so disrupting these normal perceptual processes, we undergo a different kind of experience, one that is difficult, out of the ordinary, but perhaps more intense and compelling for being so.

When this occurs with a quotidian image (as with the case of the Christmas biscuit cited above) it can arouse curiosity. But when it is an image to which we are apt to pay greater attention, such as a work of art where the artist has striven to meet certain aesthetic criteria and where our expectations of there being something meaningful are that much greater, then the indeterminate experience may be more than one of curiosity or passing frustration. As in the Joseph Wright picture or, as I hope, with my own works, the fact that the indeterminacy is coupled with a high degree of visual organization means the imaginative stimulation and conceptual engagement between viewer and work is of a far higher order, although not essentially different in kind.

## 7. Closing Remarks

I do not want to suggest that indeterminate images are inherently superior to recognizable images because they induce a uniquely intense kind of imaginative engagement. Recognizable images can be just as intriguing and absorbing, though for different reasons. We can become deeply involved in the imaginative repercussions of the Joseph Wright painting above, for example, by wondering about the relationships between the characters depicted, the psychological tensions created by the experiment in progress, or the proximity of the bird to death. None of these can be known for sure, although it is not for lack of clarity of expression. It is simply the case that, as with many of the works of Vermeer, the picture is so full of vivid details and complex possibilities that it continually nourishes our imaginations as we study it ever more closely. [15]

Nor do I want to suggest that all aesthetic experience can be accounted for by reference to visual indeterminacy, or that there is a rigid distinction between perception and cognition in the functioning of the brain. Clearly, in both cases there will be much more to it than that. I merely wish to propose that the cross-disciplinary study of visual indeterminacy, in areas as diverse as art history, art practice, psychology, and aesthetic theory, can help us to tease apart and perhaps better understand some of the most intense yet elusive aspects of the mental activity, namely aesthetic experience, perception, cognition, and imagination.

#### Endnotes

[1] See Schupbach, W., "A Select Iconography of Animal Experiment," in *Vivisection in Historical Perspective*, ed. N. Rupke (Paris: Pierre-Marc de Biasi, 1989) pp. 346-347. For a magnified view of this area of the painting, see the painting's page on the National Gallery London site: [www.nationalgallery.org.uk](http://www.nationalgallery.org.uk). Accessed May 2007. In a television documentary on the painting, *Bird in the Air Pump* (BBC Television, 2006), the presenter Benjamin Woolley claims that "scholars have argued for decades" about the identity of this object, although I've been able to find no further documentary evidence for this.

[2] For an art historical survey of visual indeterminacy, see Gamboni, Dario, *Potential Images: Ambiguity and Indeterminacy in Modern Art* (Amsterdam: Reaktion Books, 2002).

[3] This image was originally posted on the University of Wales, Newport community site in January 2007. Thanks to Michael Webb for permission to reproduce the image.

[4] For a key study on the speed of object recognition in humans, see Thorpe, S., et al, "Speed of Processing in the Human Visual System," *Nature*, 381, 6582 (1996), 520-522.

[5] For images of the author's paintings and drawings, see [www.robertpepperell.com](http://www.robertpepperell.com).

[6] Pepperell, Robert, "Seeing Without Objects: Visual Indeterminacy and Art" *Leonardo*, 39, 5 (2006), 394-400.

[7] Ishai, Almit, et al, "Visual Perception and Memory of Indeterminate Art Compositions," *Brain Research Bulletin*, Volume 73, Issues 4-6, 319-324

[8] A summary of the experiments can also be seen online at: Robert Pepperell and Ishai, Almit, "An Interdisciplinary Study of Visual Indeterminacy" in ASSC Publications, [eprints.assc.caltech.edu/80/](http://eprints.assc.caltech.edu/80/). Accessed May 2007.

[9] For a seminal essay on the formalist approach to art appreciation, see Clive Bell's essay, *Art* (London: Chatto and Windus, 1927).

[10] Pepperell, Robert, "Seeing Without Objects," 394-400.

[11] Shklovsky, Victor, "Art as Technique," in *Russian Formalist Criticism*, ed. L. Lemon and M. Reis (Nebraska: University of Nebraska Press, 1965).

[12] Even the minimal suprematist paintings made by Kasimir Malevich in the period around 1913-18 consisting only of fields of black or white paint are meaningful and to some extent representational, albeit of ideas rather than objects.

[13] Gage, John, "The Distinctness of Turner," *Journal of the Royal Society of the Arts*, CXXIII (1975), 448-458.

[14] Dorra, H., *Symbolist Art Theories* (California: University of California Press, 1994), pp. 141-142.

[15] For a discussion of the inherent ambiguity in Vermeer's paintings from a neurobiological perspective, see Zeki, Semir, *Inner Vision: An Exploration of Art and the Brain* (Oxford: Oxford University Press, 1999).



