Looking at Ophelia:

A comparison of viewing art in the gallery and in the lab

Rodrigo Quian Quiroga
is a Professor of Bioengineering and the head of the Bioengineering Research Group at the University of Leicester. He graduated in Physics at the University of Buenos Aires, Argentina and obtained his PhD in Applied Mathematics at the University of Luebeck, Germany. Before joining the University of Leicester as a lecturer in 2004, he was a post-doctoral fellow at the Research Center Juelich, Germany, and a Sloan fellow at the California Institute of Technology, USA. In 2010 he obtained the Royal Society Wolfson Research Merit Award. His main research interest is on the study of the principles of neural coding, especially for visual perception and memory.

Sandra Dudley
is Senior Lecturer in the University of Leicester's School of Museum Studies. She is a social anthropologist with interests reflected in wide-ranging publications on material culture, museums, exile and Southeast Asia, including *Materialising Exile* (Berghahn, 2010), *Museum Materialities* (Routledge, 2010) and *The Thing about Museums* (Routledge, 2011).

Jennifer Binnie
is a PhD student at University of Leicester within the School of Museum Studies and the NeuroEngineering Lab. Her PhD, funded by AHRC and The Art Fund, is looking at the impact which art within museums and galleries may have upon wellbeing.

Correspondence to:
Rodrigo Quian Quiroga,
Department of Engineering,
University of Leicester,
LE1 7RH Leicester, UK.
Tel: +44 116 252 2314
Fax: +44 116 252 2619
Email: rqqg1@le.ac.uk

Art could be thought of as a uniquely human trait, as an act of making something special.[9] Those who have the skill to create accurate representations of the world around them, and imbue their chosen media with beauty, have been revered for centuries and their abilities to use or ignore the rules of physics within their work has led to insight into how the brain works[4] such as through the exploration of visual illusions.[7] As we can clearly differentiate between a work of art and the external world, the perception of art may differ from that of everyday experience. Although the understanding of the processes involved in visual perception has progressed over recent decades,[17,11] we know relatively little of this inherently human act of viewing art.

The subjective qualities involved in the experience of art have hindered extensive scientific study in this area. The great variability involved in personal experience and the natural environment presents difficulties for researchers attempting to unpick the web of interacting factors involved, as a traditional approach of controlling the variables so that only one is altered can be impractical. At the same time, those coming from an arts and humanities perspective may be wary of such a reductionistic approach, thus the foundations of our understanding the perception of art has been built slowly. Notably, research conducted by the likes of Ramachandran & Hirstein (1999),[21] Livingston (2002),[15] and Leder et al (2004)[14] has progressed what we do understand of the perception of art. Perhaps the most well known work is that of Zeki (1999),[26] who has also investigated the connection between neural activity and visual stimuli using fMRI to see areas of brain activation when participants viewed beautiful, neutral or ugly images.[13] Eye tracking – i.e. identifying the point in space at which subjects look at each time – has also become a useful tool within visual perception research. The earliest eye tracking studies in art, by Buswell[3] and Yarbus,[25] showed that the areas of an artwork which hold the most salient information are attended the most, aiding the viewer in completing their tasks, such as being able to answer questions, or gaining the general idea of what is represented within the artwork. Berlyne[2] proposed that the pattern for viewing images was not only based on gathering information but could be also separated into two types. These were global exploration, involving looking at the whole image to get the gist of the image, and exploration of specific areas in search for more particular information. Other influences such as the individual differences of the viewer, the familiarity of image and any alterations from what was expected can also change the gaze patterns.[12,20] As eye movements are related to the information provided within the artwork, it can be extrapolated that they are also related to perceptual processing and cognition.[25,6]

While we know that task influences how we look at artwork, it is difficult to assess what is the particular 'task' or purpose of a viewer when none has been set explicitly, as is typically the case in the natural settings of museums and art galleries. Indeed the definition of what is considered art has changed many times and is often a very individual concept; thus the experience of art is also very subjective.

So far, the majority of eye tracking studies looking at art have used photographic images displayed in a lab or space other than a museum or gallery, but does this make a difference to how we view art? From a museum's point of view the authenticity of an original artwork is key to creating that specific 'kind of experience'.[1] With increasingly higher resolution images of artworks being made available to us through the internet, it could however be argued that the details seen within an original can be captured more accurately and in some cases be seen more clearly within their digital counterparts. Museums and art galleries document their collections for posterity but some within that field would argue that these are completely different objects rather than facsimiles (for different perspectives see 22,18,8). Previous research has suggested that while there is not a significant difference between the cognitive responses made to an original artwork and a digital representation, there is a difference in the affective responses made towards each of these.[23,16] If these responses differ, could it be that the viewing strategies also differ? Or more simply put, do we look at originals and digital images differently?

After conducting an eye tracking study within Tate Britain using Ophelia by Millais, we decided to compare the eye movements of participants viewing the original painting to those looking at a digital image of the same artwork, to investigate whether these different presentation formats would influence eye movements, and in turn people's experience. Millais was one of the founding Pre-Raphaelite artists and painted this iconic image of Ophelia in 1851-1852. Depicting the death of the Shakespearian character, this painting holds much symbolism within the details, with each flower representing a different virtue or message, such as the daisies for innocence and the poppy for death, with which the depth of meaning is expanded.[5]

Figure 1: Digital reproduction of Millais' Ophelia.

In the study at Tate Britain six participants were guided around the galleries and were asked to look at Millais' Ophelia for a few minutes, while wearing a mobile eye tracker (ASL MobileEye). In the Lab study eight participants took part and viewed a digital image of Millais' Ophelia painting (see Figure 1) on a monitor within a booth.The digital reproduction was scaled to fit within 1024 x 768 pixels without cropping or stretching and was shown on a black background. Participants were asked to view the image for 1 minute without any particular task. The participants' eye movements were recorded using an EyeLink II in remote setting.

Figure 2 shows the typical fixation patterns for participants within the lab and within the art gallery. While figure 2a shows all fixations in the whole 60-second trial, figure 2b only shows the first 30 seconds of this participant's trial. Due to participants' freedom to constantly move within the art gallery, to approach the artwork and adjust their viewing angle and distance (illustrated with the series of snapshots in figure 2c), showing all fixations in a static image is difficult to represent accurately, thus figure 2b shows a sample of 30 seconds when one participant's gaze was directed at the painting alone. Yet from these two examples, as well as the data from the other participants, a distinct fixation pattern can be appreciated. For the lab participant, the majority of fixations are clustered over Ophelia's face and hands, while for the participant at Tate Britain they are mostly over the undergrowth behind Ophelia.The fixation pattern in the lab environment is expected given the evidence from psychophysics experiments showing that attention is focused on faces.[10,25,3]

Figure 2. a: Typical pattern of fixations in the lab experiment. Each fixation is marked with a blue circle. b: Typical pattern of fixations in the gallery. c: Progression of movement while visually exploring Ophelia at Tate Britain. In each panel, the red cross marks the center of fixation.

To inspect whether the abovementioned difference was significant across all subjects, two regions of interest were defined for both sets of data; the first around the whole figure of Ophelia and the second being the rest of the painting. Fixations made out of the image/painting were discarded. For both the data collected in the lab and at Tate Britain, we analyzed the number of fixations in each region in the first 60 seconds of viewing, comparing those on the figure of Ophelia to those on the rest of the painting. As can be seen in Figure 3, overall participants in the lab did fixate more upon the figure of Ophelia, whereas at Tate Britain more fixations were made with in the area of the painting surrounding her. In fact, both for the Tate and lab studies there was a significant difference between the number of fixations made to the two areas of the painting but showing exactly the opposite effect: in the recordings at Tate Britain, subjects tended to look significantly less to Ophelia than the rest of the painting $p<10\text{-}3$ (T-test), whereas in the lab subjects tended to fixate significantly more at Ophelia $p<10\text{-}5$ (T-test). To further explore this different pattern of viewing the painting in the lab and the museum, we calculated the difference of the number of fixations in the two regions for both groups of subjects and compared them with a T-test. This analysis showed that the differences between looking at Ophelia and the rest of the painting obtained for the subjects in the museum and in the lab was highly significant $p<10\text{-}8$ (T-test).

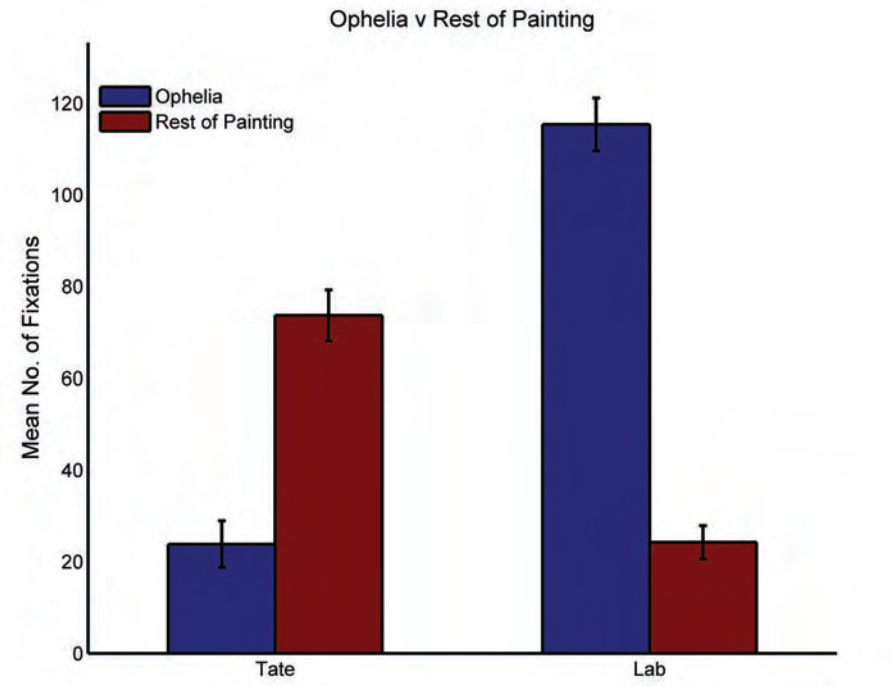

Figure 3: Mean Number of Fixations over First Minute of viewing for the subjects looking at Millais' Ophelia at Tate Britain and in the lab (Error bars denote SEM).

These contrary viewing patterns show that while the participants in the lab study focused on the smaller area of Ophelia, those in the Tate study explored more thoroughly the original artwork, exploring the larger area surrounding Ophelia. It could in principle be expected that a typical psychophysics effect of being attracted to the face, as the most salient feature (see 19 among many others) would be seen in participants in both studies. While in the lab this effect was prominent, in the museum subjects tended to explore the surrounding area of the painting, which contributes to the context in which Ophelia lies. Moreover, in the museum subjects may become interested in how the different details were painted, something one cannot appreciate in the lab. In other words, if we zoom into details in the museum, we see the brushstrokes and the texture of the paint, whereas if we do the same in the lab, we just see pixels. And unless one have telescopic vision this analysis of details follows a gradual approach to the artwork where the visitor has been drawn or directed to get closer and inspect the painting. Moreover, the onset of viewing a digital image in a lab environment is completely different, where by participants are immediately faced with a presented image at a set distance and for a predefined length of time.

The actual physical behavior of the viewer differs when in the lab compared to when in the art gallery. In the lab the participants were sitting down instead of standing and being free to walk about in the gallery, however, those in the lab did not feel so restricted as to stop them pointing, or tilting their heads to look at the image from a different angle. While at Tate, participants would alter their stance to adjust their viewing position or distance (as can be seen from figure 2c) and when looking at Ophelia this head tilt behaviour was much more prominent than in the Lab. Participants tilted their heads towards the left which brought them closer to a face on position with Ophelia which would corroborate with previous research which suggests the pull for viewers to read figures faces and to see them the correct way up.[19,24]

So what is it that causes this change in viewing behavior? Is it the physicality of the image or the 'aura' of the original, as Walter Benjamin puts it, the context from which it comes and where it is seen?[1] Of course the ideal situation would be to show both the original artwork in the lab and the digital image in the art gallery in order to get a full view of how image format and environment influence visual exploration. Although it would be possible to take a laptop into Tate to display the digital image of Ophelia it is obviously unfeasible to take Millais' original out of Tate and into a lab setting. We can only speculate how this would influence the viewing behavior. Another point to be taken into consideration is that while the size of the original painting was close to that of the displayed digital image, it was still slightly larger, something that could also influence the eye fixation patterns. Despite the small group sizes and variety of individuals involved, this differentiation of viewing pattern between these two environments was clear. Since it could be extrapolated from this study that viewers are likely to explore artworks more fully when seen in their original form within a museum, an emphasis must be put upon the importance of the viewing environment to art appreciation. This poses a challenge to scientists to be able to conduct experiments in the real world, removed from the controlled environments of the lab. Moreover, it would be then interesting to see if these findings generalise when also taking into account the individuality of the participants, their cultural backgrounds, prior knowledge and experience.

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Today with the Internet and the increasing use of digital media, it could be asked what is the point in visiting a museum or gallery to view art? One can access many artworks on the Internet along with the relevant information, but these are all just digital images, representations of the real thing. It could be argued that seeing the genuine piece of art really makes a difference to the experience, and indeed from this study alone, and for at least this one artwork, viewers do look at the original differently than a digital representation. Whether it is the texture and physicality of the artwork itself, the gallery environment or both that directs this wider exploration of the painting, it is clear that through the experience of the original the viewers are looking for more than just the most salient features. While digital images can capture increasingly high details to the point where the naked eye cannot see, they often lack this propensity to encourage the curiosity of the viewer; thus museums, art galleries and the art and objects they hold, still have the power to enthrall their patrons and make us look at the world in a different way. ◆

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