Representation and transparency in Artistic Astronomical Photographs

Abstract

The development of astronomical photography has raised many interesting epistemological, metaphysical and ethical questions as well as questions in aesthetics. One such question concerns the nature of the aesthetic properties possessed by these photographs and in this article I concentrate on one such property, namely representation. That 'artistic astronomical photographs' are representational cannot be disputed but whether this is an *aesthetic* property is open to question. In this article I show that it is an aesthetic property, and I compare it with the analogous property associated with paintings and 'traditional artistic photographs'. In order to do this I explain what makes astronomical subjects unique and the effect this has on the way the photographs are produced. I argue that it is in virtue of this uniqueness that representation as an aesthetic property of artistic astronomical photographs differs significantly from the analogous property of paintings and traditional artistic photographs.

Key Words

Astronomical photographs, aesthetic property, representation, transparancy

1. Introduction

In this article, I discuss one particularly important aesthetic property of artistic astronomical photographs; that is, representation. I begin by discussing the nature of representation in painting, and traditional photography, before going on to show that, whilst it shares some characteristics with both of these, the nature of representation in artistic astronomical photographs is different in some very important ways.

As there is little discussion of the aesthetics of astronomical photography in the literature, it is important at the outset to define some key concepts. Firstly, I only concentrate on astronomical photographs produced by non-scientists, using consumer grade photographic equipment – photographs that can be called 'artistic astronomical photographs'. These are in contrast to astronomical photographs produced as bi-products of data collected by scientific observatories, such as the Hubble Space Telescope.[1] The photographs discussed here are, therefore, 'purposefully made in order to capture, engage and sustain aesthetic experience,'[2] just as any traditional artistic photographs are. They are not produced for scientific reasons.

Furthermore, I do not discuss 'nightscapes', which are essentially landscape photographs featuring an astronomical subject (commonly the Milky Way). I only discuss photographs in which the subjects are exclusively astronomical and are, therefore, devoid of anything that we might experience in everyday life. The subjects of such photographs include nebulae, galaxies and star clusters.[3]

By 'aesthetic properties' I mean those properties of a work of art that are relevant to the *aesthetic* experience we have when examining it. These include figuration, expressiveness, form, beauty, grace, style, novelty, balance, the sublime and representation.[4] Much can be said about the role that all of these properties play in the aesthetic appreciation of artistic astronomical photographs, but in this article I concentrate on just one of them – representation.

2. Representation in art and traditional photography

In order to appreciate the essence of representation in artistic astronomical photography I will begin by providing a brief outline of the aesthetic nature of representation in non-photographic pictorial art as well as in traditional artistic photography. For simplicity, I use painting as an exemplar of non-photographic pictorial art.

2.1. Representational Painting

In general we can say that a painting is representational if it depicts objects in the real (or fictional) world, and if we can recognise them in the painting. Some paintings are ultra-representational, such as Chuck Close's 'Big Self Portrait' (1967), which could actually be mistaken for a photograph. At the other end of the spectrum lie paintings such as Picasso's 'Girl with a Mandolin' (1910), which requires much imagination in order to recognise the objects it is purported to represent. In some cases, the objects represented might only become evident on the discovery of the title of the work.

Representation is not of course *necessary* for aesthetic success. Abstract paintings may not represent anything but can still be aesthetically successful simply because of the visual experience that arises from contemplating the forms, shapes, patterns and colours in the work. However, although representation is not necessarily a property of a painting, we can ask the question: where it *is* present what is it that makes it aesthetically significant? I agree with Jonathan Friday when he says that representational paintings 'present to the viewer a particular artist's imaginative representation of real or fictional objects, and the pictorial manifestation of this is often capable of capturing [and sustaining] aesthetic interest.'[5] He goes on to say, that it is the artist's 'control over detail that makes it possible to speak of an aesthetic interest in representation for its own sake.'[6] In the case of a painting this is particularly apparent, as features right down to the level of a single brushstroke are under the direct intentional control of the painter. Consequently, when viewing such a painting, we can ask *why* the painter chose to represent the scene as he did, right down to the finest detail, and it is this that makes representation in painting aesthetically significant.

2.2. Traditional Artistic Photography

It cannot be doubted that traditional photographs are representational – there is, after all, a direct causal relationship between what appears in the photograph and the objects that were in front of the camera when the shutter was released. But just because representation is a photographic property does not mean it is aesthetically significant. For example, a 'selfie' is representational, but we would not necessarily say this is an *aesthetic* property of the photograph. For it might have been taken as an aid to memory and not to sustain aesthetic interest. Likewise, the satellite photographs provided by Google Maps are representational but, as they are produced to assist navigation, we would not necessarily say it is an aesthetic property. However, in the case of a traditional artistic photograph that *has* been taken in order to sustain aesthetic interest, it does seem reasonable to ask what it is that makes representation an aesthetic property.

As we have seen, in the case of a representational painting it is the intentional control the painter has over the fine detail that makes representation aesthetically significant. But can it be said that a photographer also has intentional control over the fine detail found in a resultant photograph? In the case of traditional artistic photography, the photographer has control over composition, lens choice, exposure, aperture, ISO, lighting and depth of field. However, it is important to recognise that the choices made do not just have a uniform, *global* effect across the resultant photograph, but actually have an intentional effect on the *fine details*. Here are a few examples of the many ways that the photographer can intentionally affect the fine detail: Firstly, by changing the depth of field (via adjusting the aperture) the photographer can produce a photograph that presents a scene some of which is in focus and some of which is out of focus. This can be seen in Fig. 1, where the hanging telephone is perfectly sharp whereas the far distance is so blurred that we have no real idea what it is – we assume it consists of buildings and cars simply because of the context of the rest of the photograph. Secondly, by varying the exposure length, moving subjects within the field

can appear either static or blurred in the resultant photograph. In Fig. 1, the two people appear blurred partly as a result of the depth of field but, more significantly, because a long exposure was used. We know they were moving when the photograph was taken because the telephone is sharp – if the blur was due to camera movement then the telephone would likewise appear blurred. Thirdly, by carefully choosing exposure and lighting the photographer can effectively remove fine detail from the resultant photograph. Judging by the poor condition of the rest of the telephone in Fig. 1 it is likely that the whole of the front of the earpiece is likewise scratched and chipped. But the photographer has effectively removed these features by the choice of exposure and lighting. In all three of these cases, the choice of camera settings completely changes the aesthetic qualities of the resultant photograph and, importantly, these changes occur *at the level of fine detail* and not across the whole photograph uniformly.

Fig. 1[7]

This shows that, by altering the camera settings before the shutter is released, the photographer is able to represent a scene in a photograph in a way that it would never appear to the naked eye; and the reason this is possible is because the human eye is not a camera, and the photographic process and the human perceptual system do not function in the same way. When I look at a scene with the naked eye I cannot help but see it as my perceptual system presents it to me. The only thing I have control over is which part of the scene I attend. I cannot (to any great extent) consciously appreciate depth of field with the naked eye because, as I move my eyes to examine different parts of the scene, my eyes automatically bring into focus that on which I attend. Similarly, by the dilation or contraction of the pupils (of which I have no control), my eyes automatically adjust their aperture to ensure I gather the most detail from the part of the scene on which I focus. The photographer, on the other hand, can intentionally represent the same scene in the photograph in a way that it does *not* appear to the naked eye, and it is this that makes a successful artistic photograph. Thus, as with the painter, the photographer does have intentional control over the fine details in the work of art they present, and this control is dependent upon choices made prior to the shutter being released. As with a painting, when we examine a traditional artistic photograph we

can ask 'why this way' when we inspect particular aspects of the scene. So, in this respect, photographs are in fact representational in a similar way to paintings.

However, there is another element to photographic representation that arises from an obvious difference between a photograph and a painting. For all the control the photographer has over the fine details, and the effect this has on the viewer's aesthetic response, the subject or scene photographed does have to exist in order for it to be in the resultant photograph. For us to accept that Fig. 1 is a photograph we have to believe that there was a hanging telephone and two people before the camera when it was taken. If we believe these to be products of the photographer's imagination then we would cease to accept photographic integrity. In the case of a painting, on the other hand, that which is represented could, literally, be a figment of the painter's imagination. It is this that leads to the intuition that, as Kendall Walton says: 'Photographs are *transparent.* We see the world *through* them'.[8] For a photograph seems counterfactually dependent on the properties of the subject and, consequently, gives us epistemic access to the world in a manner that a painting does not. Thus, when viewing a photograph, we feel that we are attaining some perceptual contact with the real world even if it is mediated by the intentions of the photographer. So, in the case of Fig. 1, even though we cannot see whether the whole of the front of the earpiece was scratched and chipped, because we know it is a photograph we can at least assume that there was a telephone before the camera; an assumption we would withhold if informed it was a painting.

This is not the place to discuss the many arguments that have been presented both in defense and in opposition to Walton's view.[9] However if, for the sake of argument, we accept Walton's basic intuition, then it seems to follow that there can be *degrees of transparency* - so a photograph can be more or less transparent depending upon how well we can see the world through it. Furthermore, depending upon the camera settings chosen prior to the shutter being released, the photographer effectively has intentional control over this degree of transparency. However, what is crucial to appreciate here is that this degree of transparency is not across the whole photograph uniformly. Rather, it is down to the fine detail because, prior to the shutter being released, the photographer can intentionally choose how transparent different parts of the resultant photograph are to be. So, for example, in Fig. 1, the part of the photograph in which the telephone is represented is more transparent than the far background. For our intuitions tell us that we see the telephone quite well through the photograph, but not the distant objects. Thus, it is the intentional control over the degree of transparency in different parts of the same photograph, that makes representation in traditional artistic photography an aesthetic property and, furthermore, different from how it is in representational painting.[10]

3. The production of artistic astronomical photographs

Having briefly outlined the aesthetic significance of representation in painting, and traditional artistic photography, I now turn to artistic astronomical photography. As with traditional artistic photographs it cannot be doubted that artistic astronomical photographs are representational – there is, after all, a direct causal relationship between what appears in the photograph and what was in front of the camera when the shutter was released. But is this representational property also an *aesthetic* property and if it is then what makes it so? I will show that it is also an aesthetic property but one that differs in kind to the related property in painting and traditional artistic photography and, furthermore, that this is in virtue of the nature of astronomical subjects.

In the last section, I explained that the traditional artistic photographer has intentional control over exposure, aperture, depth of field, composition, lens and choice of subject. Furthermore, all these decisions have a direct effect on the way the resultant photograph represents the world down to the fine details. However, as I have explained elsewhere, it must be acknowledged that releasing the shutter is in fact far from the end of the photographic process, for this action does not actually produce a photograph. Rather, in all forms of digital photography, all that happens during the period of time that the shutter is open is that the camera's sensor detects the photons that arrive from the scene and converts them into an electrical charge. A photograph is only produced after this electrical charge has been processed and interpreted by software. This can be accomplished

in two distinct ways.[11] The most straightforward is to use the camera's own processing firmware, and thus allow the process to occur automatically. If desired the result can then be tweaked on an external computer using photo-editing software. Alternatively, the camera's processing firmware can be bypassed altogether, and the raw data can be manually processed on an external computer. This affords the photographer much greater control over the final result.[12]

In the case of artistic astronomical photography, however, the automatic route is not an option because astronomical subjects are, for the most part, simply too faint to be visible to the naked eye. The only reason that the colours, shapes and forms of astronomical subjects appear in photographs is because digital cameras, in conjunction with long exposures, can detect so much more light than can be detected by the human eye. The astronomical photographer cannot rely on the camera's own firmware because this is written with the aim of processing data gathered from the kinds of subjects that we encounter in everyday life. Consequently, the only way to produce artistic astronomical photographs is to process the raw data manually on an external computer and, as I will show, this directly affects representation as an aesthetic property. In order to accentuate this point I will briefly comment on three important aspects of all photography – dynamic range, colour balance and sharpness.

3.1 Dynamic Range

Dynamic range in photography is the difference between the brightest and darkest parts of a photograph and, in most everyday scenes, there is an appreciable spread of shades from the darkest to the brightest. The camera's firmware can automatically deal with this and can usually do a reasonably good job of presenting the brightest and dimmest parts of the scene in the resultant photograph in a way that appears natural. If the traditional artistic photographer wishes to undertake this process manually then the way the scene appears to the naked eye can be used as a guide, so there is an element of objectivity to the activity even if, for aesthetic reasons, the photographer wishes to substantially alter the dynamic range in order to diverge from the natural appearance.

However, because astronomical scenes are very faint the majority of the data in the photograph lies towards the dark end of the scale, as can be seen in Fig. 2, which is raw data straight from the camera of the Eta Carina Nebula.[13] The only things that are visible in this photograph are the very brightest stars and some of the brightest patches of nebulosity. As I have explained elsewhere, camera firmware is simply not able to cope with this and so, in order to successfully present the scene in the resultant photograph, the light collected by the camera has to be *manually stretched* by the photographer so that the full range of intensities are represented in the photograph concurrently. The problem that the astronomical photographer faces is deciding how to manually stretch this collected light. This is because, as the subjects are largely invisible to the naked eye, there is nothing with which to compare the photograph and so, unlike in the case of traditional artistic photography, there is no objective guide and therefore no way of arriving at a 'natural' appearance. The whole photograph cannot be simply brightened linearly because, if it is, the brightest parts become too intense, whilst the fainter background remains barely detectable. To avoid this the photographer has to stretch the data non-linearly and this means that he is free to choose which parts of the scene to brighten, and which parts to keep dark, right down to the level of the fine detail. So in order to effectively represent the scene, the astronomical photographer has to make subjective decisions as to how the dynamic range of the scene is to be distributed across the photograph. And as there is no objective criterion guiding this process the end result will never be 'natural' and will always vary, even if the same person processes exactly the same data twice. One such result, derived from the data shown in Fig. 2 after it has been stretched non-linearly, can be seen in Fig. 3.
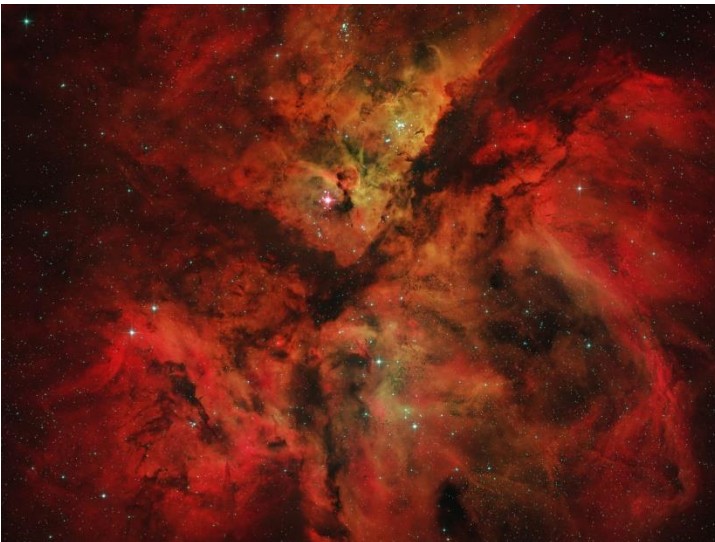
Fig. 2

Fig. 3

3.2 Colour Balance

A second important aspect of producing any colour photograph is achieving correct colour balance. As with dynamic range, in the case of traditional artistic photography, the manufacturer's firmware automatically ensures a relatively realistic colour balance in the resultant photograph and this is because the software engineers have calibrated the algorithms with the natural colours we see with the naked eye. Thus, again, there is an objective guide available. The photographer is, of course, at liberty to manually alter the colour balance in post processing, but when they do they still have a good idea of what the 'natural' colours are because they can be perceived with the naked eye. The situation is, however, very different for the astronomical photographer because the colours of astronomical subjects are usually too dim to be seen with the naked eye (even through a telescope), and so such comparisons cannot be made. From the data acquired it might be obvious which parts of the scene have the highest abundance of red, green and blue, but there is no objective way of deciding the shades of these colours and, therefore, the resultant secondary colours. As with dynamic range, it is necessary for the astronomical photographer to balance the colours manually, by making subjective decisions, as there is no objective criterion to use in order to determine a 'natural' colour balance. Fig. 3 and Fig. 4 are two versions of the Eta Carina Nebula

processed, by different people, from the data found in Fig. 2, and there is no objective way of judging whether either presents a 'natural' colour balance.

Fig. 4

3.2 Sharpness

A third important aspect of all forms of photography is sharpness. It is usually the case that with traditional artistic photographs at least part of the scene is sharp. In Fig. 1 the overall aesthetic effect is enhanced because the telephone is sharp whereas the rest of the photograph is blurred. This has been achieved by the choice of depth of field as well as the inclusion of moving subjects.[14] In the case of astronomical photography neither of these options are available because, firstly, all astronomical subjects are at 'infinity' so depth of field cannot be exploited, and secondly, on human time scales at least, they are static. Nonetheless, sharpness is a very important aspect of this form of photography but, in this case, any lack of sharpness arises from a very different cause. All astronomical subjects reside beyond the Earth's atmosphere and photographing through it causes problems. For even if the photographer has achieved perfect focus the subject may appear defocused and blurry because of atmospheric turbulence, caused by the irregular movement of air, water vapour and smoke particles.[15] Unfortunately, this is beyond the control of the astronomical photographer and it is, therefore, necessary to employ sharpening algorithms in post processing in order to recover any detail lost. Fig. 5 is a photograph of the Helix Nebula, which is in perfect focus, but much of the detail is lost due to the blur caused by atmospheric turbulence. Fig. 6, on the other hand, is the same photograph after sharpening has been applied. However, as the subject is too dim to be seen clearly with the naked eye, how much sharpening, and to which parts of the image it should be applied, is a subjective decision that each photographer must make. And so, as with dynamic range and colour balance, there is no objective guide that can be used to aid this.
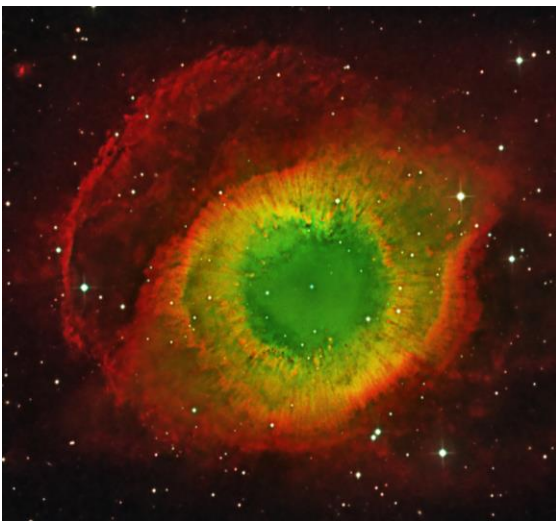
Fig. 5

Fig. 6

It is intuitive to think that, with respect to dynamic range, colour balance and sharpness, subjective decisions are only necessary because astronomical subjects are so distant and, *as a consequence*, are faint. Surely if we were able to fly close to these subjects then they would be clearer and brighter and thus visible to the naked eye. The astronaut photographer could then represent the subjects objectively because he would be able to compare the resultant photograph with the naked eye view. As with the traditional photographer, from such a vantage point he would be able to achieve a 'natural' dynamic range, colour balance and sharpness. On his return to Earth, we would then be able to decide which of Figs. 3 or 4 is the most 'natural'.

However, the assumption that is at the heart of this thought experiment is actually incorrect because, although an extended astronomical subject, such as a nebula or galaxy, would appear larger the closer you were to it, its brightness would be spread out over a larger area and so the average brightness would actually remain constant. This means the intensity would appear exactly the same to the naked eye however close you got to it. It may be counter intuitive but the Eta Carina Nebula (Fig. 4) would still be largely invisible and colourless to the naked eye even if you were to fly right through it. Consequently, however close you got to it, any photograph taken would still rely on the subjective decisions favoured by the photographer during the processing stage. Thus, it is not simply because astronomical subjects are far away that makes it impossible for the photographer to represent the dynamic range, colour balance and sharpness naturally. Rather, it is

an intrinsic property of extended astronomical subjects that makes this impossible, and this property is not possessed by anything that is the subject of traditional artistic photography.

4. Representation in artistic astronomical photography

So how does this leave representation as an aesthetic property of artistic astronomical photographs? Earlier I argued that, in the case of representational painting, it is the direct intentional control that the painter has, right down to the fine detail, which makes representation an aesthetic property of the painting. I went on to show that the traditional artistic photographer also has direct intentional control right down to the fine detail. But because photographs are transparent it is actually the control over the degree of transparency in different parts of the same photograph that makes representation in traditional artistic photography an aesthetic property and, therefore, distinguishes it from the analogous property in representational painting.

Taking into account the high level of subjectivity that is involved in order to produce an artistic astronomical photograph, it is tempting to think that representation, as an aesthetic property, is closer in character to how it is in a painting rather than a traditional photograph. After all, in artistic astronomical photography you start with what appears to be a blank canvas (such as Fig. 2) and, by making subjective decisions, work towards the final product that fulfills your aesthetic desires (such as Fig. 4). However, this analogy is flawed because an astronomical photograph is not really a blank canvas. For the photographic data is there from the start of the process - it is just hidden in the shadows and only appears once it has been stretched. So representation in artistic astronomical photography is in fact very different from that found in representational painting. With representational painting the artist is free to represent the scene in whatever way she chooses and can even add imaginary objects, should she desire. But this freedom is not accorded to the artistic astronomical photographer for the photographer can only work with the light captured by the camera, which originated in the astronomical subject. In common with all photography it certainly cannot be denied that artistic astronomical photographs are transparent to some degree, because they are counterfactually dependent on the properties of the subjects and do give us some epistemic access to the world in a manner that paintings do not. Consequently, unlike the painter, the artistic astronomical photographer is not free to simply create or erase parts of the scene, or arbitrarily change the colours, for once such actions are performed the photograph becomes an abstract digital picture.[16]

So does this mean that representation in artistic astronomical photography and traditional artistic photography are identical? We have seen that, in the latter case, it is the direct intentional control over the degree of transparency in different parts of the same photograph that makes representation an *aesthetic* property and therefore distinguishes it from the analogous property in representational painting. In addition, the traditional photographer is fully aware of the degree of transparency found in different parts of their photograph because they were in front of the scene when it was taken. Furthermore, other viewers of the photograph can usually form reasonable conjectures about how transparent different parts of the photograph are by making comparisons with the way objects in the real world usually appear to the naked eye. There is, therefore, an objective guide to establishing how transparent aspects of the photograph are; that is, how they would appear to the naked eye.

In the case of artistic astronomical photography, the photographer has a similar level of control over the fine details in the photograph, and therefore control over the degree of transparency in different parts of the same photograph down to the fine detail. However, what is different here is that the photographer does not know how transparent the different parts of the resultant photograph are and, subsequently, neither does any viewer. This is because there is no objective guide - for in the case of most astronomical subjects, we cannot ask the question 'how would they appear to the naked eye?' because they are *intrinsically* too faint to be seen. There are some basic principles that the photographer can follow when processing the photograph, if he knows some of the science behind the subjects, and consequently such knowledge can guide the

photographer, and the subsequent informed viewer, when they are trying to comprehend the degrees of transparency. But, for much of the time, there is a lack of objectivity and it is this lack of knowledge of the degree of transparency across a photograph that makes the aesthetic property of representation in artistic astronomical photography different from the analogous property in traditional artistic photography.

5. Conclusion

In this article, I have examined the nature of representation as an aesthetic property of astronomical photographs. In order to do this I have compared it with the analogous property associated with painting and traditional artistic photography. In the case of the former, representation is an aesthetic property in virtue of the fact that the painter has intentional control over the fine details found in the painting. In the case of the latter, representation is an aesthetic property in virtue of the fact that the traditional artistic photographer has intentional control over the degree of transparency of the fine details found in the resultant photograph. Furthermore, there is an objective guide for determining the degrees of transparency because the subjects are, at least in principle, visible to the naked eye. I have shown, however, that in the case of artistic astronomical photography, representation as an aesthetic property differs from both of these. As with the painter the artistic astronomical photographer does have intentional control over the fine details found in the end result. However, as is the case with the traditional artistic photographer, they also have intentional control over the degree of transparency of these fine details. Where it differs is that, unlike traditional artistic photography, there is no objective way of knowing how transparent these fine details are and so subjective decisions, in addition to the imagination, play a huge role in determining how the photographer represents the scene in the final photograph. It is this that makes representation such a rich aesthetic property in artistic astronomical photography.

1   M. Lynch and S. Edgerton, "Abstract Painting and Astronomical Image Processing," in *The Elusive Synthesis: Aesthetics and Science*, ed. A. I. Tauber (Netherlands: Kluwer Academic Publishers, 1996), pp. 120-123.

2   Jonathan Friday, *Aesthetics and Photography* (Aldershot: Ashgate Publishing Limited, 2002), p. 33.

3   As artistically successful astronomical photography is only possible by virtue of digital technology, I will also not discuss film photography here.

4   Jonathan Friday, *Aesthetics and Photography*, p. 30.

5   *Ibid.*, p. 69.

6   *Ibid.*, p. 70.

7   Photograph by Michael Penn, (retrieved from http://michaelpennphotography.com/index.php/category/the-philadelphia-project-select/)

8   Kendall Walton, "Transparent Pictures: On the Nature of Photographic Realism," *Critical Inquiry* 11 (1984), pp. 246-277; ref. on p. 251.

9   For example, see Edwin Martin, "On seeing Walton's Great-Grandfather," *Critical Inquiry* 12 (1986), pp. 796-800; Kendall Walton, "Looking again through Photographs: A Response to Edwin Martin," *Critical Inquiry* 12 (1986), pp. 801-808.

10 Walton points out that his 'transparency thesis' was originally formulated in terms of film photography. See Kendall Walton, *Marvelous Images: On Values and the Arts* (Oxford: Oxford University Press, 2008), p. 115. Without justifying it here, I believe that much of this thesis can also be applied to digital photography.

11 For a more detailed discussion see Jiri Benovsky, "Three Kinds of Realism About Photographs," *Journal of Speculative Philosophy* 25 (2011), pp. 375-395; Also Stephen Chadwick and Martin Paviour-Smith, *The Great Canoes in the Sky* (New York: Springer, 2016).

12 For an in-depth outline of this process, see Jiri Benovsky, "The Limits of Photography," *International Journal of Philosophical Studies* 22 (2014), pp. 716-733.

13 All astronomical photographs taken by the author of this article.

14 Of course, the photographer is at liberty to make all parts of the photograph blurry if they desire, and they can purposefully achieve this by defocusing on all parts of the scene or by moving the camera during the exposure.

15 This effect is known as *astronomical seeing* and the extent differs from night to night and with geographical location. The only way to avoid this completely is to situate photographic equipment above the atmosphere, as is the case with the Hubble Space Telescope.