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## Artistic Astronomical Photographs and Representation

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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 paper I concentrate on one such property, namely representation. That modern, 'artistic astronomical photographs' are representational cannot be disputed but whether this is an *aesthetic* property is open to question. In this paper I show that it is an aesthetic property, and compare it with the analogous property of paintings on the one hand and 'traditional artistic photographs' on the other. I explain that what makes representation an aesthetic property of a painting is the artist's intentional control over the fine detail, whereas in the case of traditional artistic photography it is the intentional control over the level of transparency of the fine details. I go on to explain that many astronomical subjects are unique because they are intrinsically invisible to the naked eye and I outline some of the photographic processes that it is therefore necessary to undertake in order for an artistic astronomical photograph to be produced. I argue that it is in virtue of this that representation as an aesthetic property of artistic astronomical photographs differs significantly from the analogous property of painting and traditional artistic photography.

## 1. Introduction

There has been some discussion of astronomical photography in the aesthetics literature but, for the most part, it has concentrated on photographs taken by professional scientific observatories such as the Hubble Space Telescope.<sup>1</sup> The ultimate purpose of these observatories is to capture data for scientific research and the spectacular photographs that have

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<sup>&</sup>lt;sup>1</sup> The most comprehensive discussion is Kessler (2012).

been released for public consumption are really just a bi-product of this (Lynch and Edgerton, 1996, pp. 120-123). For aesthetic effect the colours in some of these photographs are represented arbitrarily and, in many cases, data from wavelengths beyond the visible range are assimilated. This has led to the charge that they are just 'pretty pictures' (Snider, 2011, p. 3). Consequently, the philosophical discussion of such photographs has tended to view their aesthetic worth as secondary to the scientific value inherent in them. As they are a bi-product of scientific data I call these sorts of astronomical photographs 'scientific astronomical photographs'. However, what these discussions have overlooked is the fact that, over the last ten years, modern digital technology has progressed to such an extent that astronomical photographs with aesthetic properties can now be taken by non-scientists using consumer grade cameras and optics often similar to those used in traditional artistic photography (Chadwick and Cooper, 2011). Furthermore, these photographs are not produced for scientific reasons but are "purposefully made in order to capture, engage and sustain aesthetic experience" (Friday, 2002, p. 33). It is for this reason that I call such photographs 'artistic astronomical photographs'. In this paper I restrict the discussion to these sorts of astronomical photographs so that a fair comparison can be made with traditional artistic photographs that are likewise made for aesthetic and not scientific reasons. I do not, however, include 'nightscapes' in this discussion. Although these contain an astronomical element, usually the Milky Way, they are more akin to landscape photographs as an essential element to their aesthetic success is the terrestrial foreground.<sup>2</sup> The subjects of the sorts of artistic astronomical photographs that I wish to discuss are purely astronomical and include nebulae, star clusters and galaxies. These are the most interesting from a philosophical point of view because they are largely devoid of things we experience in everyday life that are usually the subjects of traditional artistic photography. I must add that this paper concentrates solely on digital photography, partly because digital has largely superseded film in most realms of photography but, more importantly, it is only by virtue

<sup>&</sup>lt;sup>2</sup> The fact that nightscapes do contain astronomical subjects does raise some of the issues discussed in this paper but I will not pursue this here.

of digital technology that artistic astronomical photographs can be taken.<sup>3</sup>

By aesthetic properties I mean those properties of a work of art that are relevant to the *aesthetic* experience we have when viewing it. These include figuration, expressiveness, form, beauty, grace, style, novelty, balance, the sublime and representation (Friday, 2002, pp. 30). Much can be said about the role that all of these properties play in the aesthetic appreciation of artistic astronomical photographs but in this paper I concentrate on one of them – representation.

## 2. Representation in Art and Traditional Photography

In order to appreciate the role of representation in artistic astronomical photography I 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 nonphotographic 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 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 due to the purely 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 signific-

<sup>&</sup>lt;sup>3</sup> Whilst astronomical photographs taken with film were certainly extremely important scientifically, it is unlikely that most people would claim that they had much *aesthetic* value. For a collection of such photographs see Malin and Murdin (1984).

ant? Jonathan Friday 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" (Friday, 2002, p. 69). 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" (Friday, 2002, p. 70). With paintings 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 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. However, with a traditional artistic photograph, that *has* been taken in order to sustain aesthetic interest, what is it that makes representation an aesthetic property?

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 details found in a resultant photograph? In the case of traditional artistic photography the photographer has control over exposure, aperture, lighting and depth of field. However, it is important to realise 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 adjusting the depth of field (via altering the aperture) the photographer can produce a

photograph which presents a scene some of which is in focus and some of which is out of focus. Secondly, by using a very short exposure, a moving object can be made to appear static in the resultant photograph. Thirdly, by carefully choosing exposure and lighting the photographer can effectively remove fine detail from the resultant photograph, such as in [FIGURE I]. It is highly likely that the woman represented in this photograph had some skin blemishes and it surely goes without saying that she had a neck. But by the expert choice of exposure these features have effectively been removed from the resultant photograph. In all three of these 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 just globally, across the whole photograph uniformly.



FIGURE I. Bill Brandt Nude, 1952.4

So altering the camera settings enables the photographer to represent a scene in a photograph in a way that it would never appear to the naked

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<sup>&</sup>lt;sup>4</sup> Photo courtesy of the Bill Brandt Archive and the V&A.

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 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, my eyes automatically adjust to ensure I gather the most detail from the part of the scene on which I am focused. 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. So, 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. (Potential changes that can be made in the processing stage will be discussed later.) As with a painting, when we view a traditional artistic photograph we can ask 'why this way' when we examine 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 in the photograph, and the effect this has on the observer's aesthetic response, the object or scene photographed does have to exist in order for it to be in the resultant photograph. As Barbara Savedoff says: "if there is a horse in a photograph, we assume that there must have been a horse in front of the camera, since the horse cannot be a product of the photographer's imagination" (Savedoff, 1997, p. 202). In the case of a painting, on the other hand, that which is represented could, literally, be a figment of the imagination. It is this that leads to the intuition that, as Kendall Walton says: "Photographs are transparent. We see the world through them" (Walton, 1984, p. 251). 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

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world even if it is mediated by the intentions of the photographer. So, in the case of [Figure 1], even though we do not know whether the woman had skin blemishes, or whether it was in fact just a waxwork model, because we know it is a photograph we can at least assume that there was a female figure in front of the camera when the shutter was released; 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.<sup>5</sup> However, what does seem to be the case is that there can be *levels of transparency*, so a photograph can be more or less transparent depending upon how well we can see the world through it. In having control over the fine detail the photographer effectively has intentional control over the *level of transparency* presented in the resultant photograph, but the crucial point here is that this is not just *globally*, i.e. across the whole photograph equally. Rather it is down to the *fine detail* and so, prior to the shutter being released, the photographer can intentionally choose how transparent different parts of the resultant photograph are to be. And it is *this* control, over the level 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.

## 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

<sup>&</sup>lt;sup>5</sup> For example, see Martin (1986) and Walton (1986). Walton points out that his 'transparency thesis' was originally formulated in terms of film photography (Walton, 2008, p. 115). Without justifying it here, I believe that much of this thesis can be applied with equal force to digital photography.

property but one that differs in kind to the analogous property in painting and traditional artistic photography and 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. All these decisions are made prior to the shutter being released and they all have a direct effect on the way the resultant photograph represents the world down to the fine details. However, 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. In order for a photograph to be produced, the raw data that has been collected by the sensor has to be processed by software and there are two ways in which this can be achieved.<sup>6</sup> The most straightforward is to use the camera's firmware - the software that is installed into the camera itself. If the photographer wishes, however, the internal firmware can be bypassed and the raw data can be downloaded onto an external computer and manually processed in photographic software.<sup>7</sup> If this method is chosen then the photographer can manually alter many aspects of the photograph such as brightness, colour balance, sharpness and so on.

In the case of artistic astronomical photography, however, using automatic software 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 automatic software because this is written with the aim of processing data gathered from the kinds of subjects that we meet in everyday life. Consequently the *only* way to produce artistic astronomical photographs is to process the data

<sup>&</sup>lt;sup>6</sup> For a more detailed discussion see Benovsky (2014) and Chadwick and Paviour-Smith (2016).

<sup>&</sup>lt;sup>7</sup> For an in-depth outline of this process see Benovsky (2014).

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 two important aspects of all photography – dy-namic range and colour balance.

## 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 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.



FIGURE 2. Details given in the text.

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

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seen in [FIGURE 2], which is raw data of the Pleiades star cluster.<sup>8</sup> The only things that are visible in this photograph are the very brightest stars. Automatic software 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 brightest and the dimmest parts appear in the photograph concurrently. The problem that the astronomical photographer faces is deciding how to manually stretch this collected light 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 simply be brightened linearly because, if it is, the brightest parts become too intense whilst the fainter background remains barely detectable, as can be seen in [FIGURE 3].



FIGURE 3. Details given in the text.

<sup>8</sup> All astronomical photographs in this paper © Stephen Chadwick.

Rather, through numerous tiny increments, the photographer has to choose which parts of the scene to brighten, and which parts to keep dark, in order to produce a photograph that satisfies his aesthetic end. 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 end result derived from the data shown in [FIGURE 2] can be seen in [FIGURE 4].



FIGURE 4. Details given in the text.

#### 3.2. Colour Balance

A second important aspect of producing any 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 developers 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 but when they do they still have a good idea of what the 'natural' colours are in the scene that was photographed for 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 light collected by the camera it is obvious which parts of the scene contain the most red, green and blue but there is no objective way of deciding the shades of these colours and this greatly affects 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. [Figures 5 & 6] show exactly the same photograph of the Eta Carina Nebula that has been processed by two different people and there is no objective way of saying whether either presents a 'natural' colour balance.



FIGURE 5. Details given in the text.

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![](_page_14_Picture_2.jpeg)

FIGURE 6. Details given in the text.

But surely this need for subjective decisions only exists because the subjects of astronomical photographs are at such large distances from us and as a consequence of this they 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 photographer could then represent these subjects objectively because then they would be able to compare the photograph with the naked eye view and hence achieve an objectively correct dynamic range and colour balance. We would then be able to decide which of [Figures 5 and 6] was 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. The Pleaides [Figure 4] would actually still be largely invisible and colourless to the naked eye even if you were to fly right through it and, 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. So it is not simply because they

are so far away that makes it impossible for the photographer to represent the dynamic range and colour balance 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 level 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 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 [Figure 2] and, by making subjective decisions, work towards the final product that fulfills your aesthetic desires [Figure 4]. However, this analogy is flawed because an astronomical photograph is not really a blank canvas. For the photograph is there from the start of the process - it is just hidden in the shadows and only appears once the data 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 they choose and can even add imaginary objects, such as a horse, should they desire. But this freedom is not accorded to the artistic astronomical photographer for the photographer can only work with the light, captured by the cam-

era, 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.<sup>9</sup>

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 level of transparency in different parts of the same photograph (via the ability to control the fine details), that makes representation an *aesthetic* property and therefore distinguishes it from the analogous property in representational painting. In addition the photographer is fully aware of the level of transparency of the different parts because they were in front of the scene when the photograph was taken. Furthermore, other observers 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. So, for example, intuition tells us that the black area below the woman's head in [Figure 1] is not transparent, because it is reasonable to assume that the woman photographed had a neck. But even if an observer cannot be sure how transparent different parts of a photograph are there does seem to be, at least in principle, an objective guide to determining this, namely how would the scene have appeared if observed with the naked eye - something of which the actual photographer is well aware.

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 level of transparency in different parts of the same photograph. However, what is different here is that the photographer does not know how transparent the different parts of the resultant photo-

<sup>&</sup>lt;sup>9</sup> These techniques are often undertaken when 'scientific astronomical photographs' are processed and this is one reason why they should only be considered 'pretty pictures' and not photographs.

graph are and, subsequently, neither does any other observer of the photograph. And this is because of the lack of an 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 conjectures that can be formed and applied by the photographer when processing the photograph if they know some of the science behind the subjects. So, for example, the informed photographer knows that the brightest parts of [Figure 4] should be the stars because astronomers tell us that stars are always brighter then nebulosity. Such knowledge can guide the photographer, and the subsequent observer of the photograph, when trying to comprehend the level of transparency. But for much of the time there is a lack of objectivity and it is this lack of knowledge of the level 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 paper 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 level of transparency of the fine details found in the resultant photograph. Furthermore, they have knowledge of the levels of transparency and this arises from the fact that the subjects of the photographs are, in principle, visible to the naked eye. There is therefore an objective guide that can be used to measure transparency. 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 level 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 subjectivity and 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.

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