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Light on the Dark Side: Images and Reflections from Outer Space

Imagery from outer space has been coming at us from all directions over recent decades. Elizabeth Kessler[1] estimates the Hubble space photos have seen the greatest diffusion of all scientific images into popular hands — maybe of all time. The media, including television and print newspapers, have been important in their distribution, but, increasingly, imagery of space has been coming to audiences through online channels. The theme of this paper is a reflection on website representation of visual aspects of the enculturation of what is called space, the region beyond the atmosphere of planet earth.

A study of online media is timely since attention to scientific representation in news media has until now mostly covered print formats. Online communication gives scope for changes in several dimensions, such as the inclusion of multimedia, changes in frequency of publication, more audience interaction, the display of reader comments and conversations,

[1] Elizabeth Kessler, *Picturing the Cosmos: Hubble Space Telescope Images and the Astronomical Sublime,* Minneapolis, London, 2014, University of Minnesota Press, 2014.

sharing on social media, and a range of potentials including unrestricted quantities of visual and verbal content. The news values — the criteria for inclusion of content on a webpage — of space coverage have not recently been studied.

This discussion is based on output from four websites, from which the images and texts are all taken: *The Guardian* online space section (UK), *Le Figaro*'s science section (France), the space section of the *New York Times*, and the blog by the science editor of NBC, called *Cosmic Log* (U.S.). All the sites were intermittently tracked over 24 months from July 2011 recording screenshots of text, images, multimedia, and headlines. Space images and debates are growing in public appeal. Space stories can be the most popular of any topic of the day, outstripping sport and politics according to the chief science editor of the German newspaper *Die Welt* (2013; interview with author).

What kind of images are we talking about? Sometimes pictures on the sites are of astronauts; very often they are of rockets and gadgets in space (much the most numerous), or they focus on non-human scientific events and conditions, like the atmospheres or surfaces of celestial bodies. They include pictures of distant phenomena in space of interest to astrophysicists answering questions on the origin and fate of the universe. Among these are beautiful pictures (**fig. 1**) and also plainer images (**fig. 2**), such as conditions after the big bang that are highly newsworthy because they tell of an important adjustment of scientific understanding. There are also attractive images of planets inside the solar system (**fig. 3**) that interest planetary scientists rather than astrophysicists. The images are often linked to narratives of discovery as revealed in accompanying text. It is a feature of space imagery that it is very dependent on explanatory text. Nearly all fall under a positive trope of epic human activities.

The focus on newspaper website representations allows a comparison with interpretations of news photography and journalism in the pre-Internet

era of print. How have digital presentations changed things — are we still concerned with journalistic photographs as bearing the signs of objectivity, truth-telling, or evidence? Do the selection criteria for images and video used online mirror past definitions of news values given for science by Nelkin[2] or Hansen[3]? These authors list several factors that make news in science, such as human angle, relevance to everyday life, accessibility, proximity, controversy, breakthrough, and weird and wacky. As Hansen says, many of them mirror established newsworthiness criteria found in general news, such as cultural fit, event magnitude, proximity, unambiguity, reference to elite people/nations, relevance, consonance, and predictability, as first suggested by Galtung and Ruge[4]. Nelkin (*Ibid.*) comments on the breakthrough euphoria that infected the reporting tone of the 1960s linked to space exploration, and although it gave way to disillusion for a while, the notion of "breakthrough" has often been noted as a key driver for science inclusion in news.

Do space images move the boundaries and challenge the rough uniformity seen in decision-making practices of news? The web, after all, is another "organizational arrangement" for science presentation in media in the same way as newspaper sections devoted to science allowed considerably more flexibility than news sections, as noted by Hansen (*Ibid.*). The online medium offers even more scope to show content, and journalists are less bounded by time deadlines.

It's worth bearing in mind that one constriction on extra-terrestrial reporting derives from the fact that almost all space imagery is supplied by outside sources. News people rarely take their own space photos, unless they are easily observed, like meteor strikes or nearby eclipses. The reliance on

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[2] Dorothy Nelkin, *Selling Science: How the Press Covers Science and Technology,* New York, Freeman Press, 1987.
[3] Anders Hansen, "Journalistic Practices and Science Reporting in the British Press" (1994) *Public Understanding of Science,* Vol. 3 N° 2, pp. 111-134.
[4] Johan Galtung and Marie Holmboe Ruge, "The Structure of Foreign News. The Presentation of the Congo, Cuba and Cyprus Crises in Four Norwegian Newspapers," *Journal of Peace Research*, Vol. 2. N° 1, 1964, pp. 64-91.

scientific image sources like the cameras on the space probe Curiosity in 2013 structure space science journalists more into the game of relay than of originators, since there is a self-evident removal of the journalistic power of witness for much of outer space. Anyway, science reporting has always been dependent on expert sources and science writers exercise their professionalism mostly in terms of judging their validity (Hansen, *Ibid.*).

Science and Journalism

The relationship of science and journalism, and the interpretive functions of the institution of journalism are hugely complex. In part they may be said to revolve around a series of journalistic tenets including the commitment to accuracy, completeness, and balanced content selection. Accuracy includes the act of transference from one set of terminologies to another, or the transference of complex physics and biology into metaphors of non-scientific discourse and everyday experience. Completeness refers to the extent of coverage of potential scientific topics. One approach to judge this aspect is to look at science sources for comparison. If one uses the source arXiv.org that lists many topical astronomical and pure physics journal reviewed articles, it isn't difficult to show that the overwhelming majority of journal papers to do with astrophysics and astronomy are ignored by media.

As well as their output lacking faith to true science as conceived by scientists[5], journalists are sometimes accused of negativity and as being "an opaque lens unable to present and filter scientific content properly," which is said to have contributed in the past to the scientific illiteracy of the public. There is a large literature on the negative aspects of the coverage of science. Nelkin (*Op. cit.*) calls journalists and scientists "wary collaborators in the business of science communication," even if mutually dependent. She accuses

[5] Massimiano Bucchi and Renato Mazzolini, "Big Science, Little News: Science Coverage in the Italian Daily Press, 1946-1997," *Public Understanding of Science*, 2003, pp. 7-24.

the media of paying scant attention to the substance of scientific arguments, or its slow accumulative processes, or the limits of its theories. All of this, she says, "helps perpetuate the distance between science and citizen." Schnabel[6] points to a contrary narrative in media whereby science is uncritically idealized as an ultimate authority, a theme explored also by Broks[7]. There are also more positive impressions of the role of media, such as that it conducts a pivotal and complex act of mediation for public understanding and for scientists themselves to further their research (Bucchi and Mazzolini, *Ibid.*, Broks *Ibid.*).

Astronomy is among the most illustrated topics in science in the Press — 54 percent of meteorological stories had pictures, according to Bucchi and Mazzolini, (*Ibid*). Although this finding applied only to Italy, it is reasonable to assume that the proportion might be replicated elsewhere. Dutt and Garg[8] found that in 1996 the astronomy stories in Indian English-language papers were the most abundantly supplied with visual material of all the science topics they analysed. Almost 100 percent of items had either drawing, graphic or photograph.

The quality and analysis of pictures in astronomy has barely been debated in the literature about journalism. Many are attractive to look at, which in my view, is one of their most striking features, inviting analysis of pictorial qualities. Only a small proportion of texts about journalism focus on aesthetics. Åker[9] records how still and moving images have been primarily investigated for their contribution to the realm of journalistic professional mythologies such as objectivity ideals, and the role images play as "evidence" and to convey "realism." One exception focuses on an image from the Hubble telescope

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[6] Ulrich Schnabel, "God's Formula and Devil's Contribution: Science in the Press," *Public Understanding of Science*, N° 12, 2003, pp. 255-259.
[7] Peter Broks, *Understanding Popular Science,* Maidenhead, Open University Press, 2006.
[8] Bharvi Dutt and K. C Gharg, "An Overview of Science and Technology Coverage in Indian-English-Language Dailies," *Public Understanding of Science*, Vol. 9, 2000, pp. 123-140.
[9] Patrik Åker, "Photography, Objectivity and the Modern Newspaper," *Journalism Studies*, Vol. 13 N° 3, 2012, pp. 37-41.

interpreting the image *The Pillars of Creation* (**fig. 4**) in which Greenberg[10], showed how public reception of the image strayed from either the scientists' intended meaning or the one espoused by some media. In this case people began to see iconic religious images among the pictured forms.

It is unusual to link photography in news to art, but Åker (art. cit., 326) proposes that a new genre of newspaper photograph is emerging, which is not concerned with evidence or drama but that relays everyday events and connects with artistic traditions. Such ideas, he says, are complicated by traditions of photorealism because at the turn of the 20th century art was defining itself against what was perceived to be the mindlessness of mechanical reproduction achievable by photos. He is fascinated by a new type of photograph sometimes given to front pages, "aesthetically pleasing…often enigmatic" images, of everyday life, neither sensational nor evidential. He believes digitization is changing the nature of public reception of journalism and photographic images and the type of images they want. The public are savvy, understand that analogue techniques and objectivity ideals went together, and that they are dissolving. He suggests that digitisation and a photo-op culture have led people to understand that photographs are "interpretations and constructions of reality and not parts of it." The relevance of this perspective is that it admits that content has a news value (a reason for content inclusion) that connects with aesthetics and art, and also that consumer preferences are affected by the technologies of production and delivery.

So far, then, we can see only occasional reference to the aesthetic side of pictures in the press, or to the content of space photography. Picture analysis has been limited to the traditional concerns of journalism with its mythologies of truth and evidence, and has barely touched on concerns of artistic content.

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[10] Joshua Greenberg, "Creating the 'Pillars': multiple meanings of a Hubble Image," *Public Understanding of Science,* Vol. 13, 2004, pp. 83-95.

It follows that to pursue a discussion specifically on aesthetics, it is necessary to look at literature outside journalism studies. On space imagery itself, the ground was broken by Lynch and Edgerton[11]. They made important observations, including the point that the image creators worked both in an artistic and scientific dimension and thus innovated in the way they connected culture and science. For the science, the criterion of self-assessment of the technical and scientific digital imaging process was to clarify the data from astronomical instruments to reflect different physical properties of the objects examined.

Choices of colour palettes (they didn't mention shapes) depended on the ability to clarify data to reflect the intensities, energy levels and wavelengths of received information. The choice of colours was ultimately arbitrary, and was decided on by a host of factors including, when they wrote, the limitations of software.

It must be realized that in some space imagery there is no visual object to depict and often limited possibility of representational realism. Much visual imagery we receive through scientific channels represents what is actually extra-sensory. Radio astronomy arrives in digital form and relays wavelength data that technicians and scientist translate into shapes and colours visible to the eye. When working as scientists rather than as artists, the image makers' aim is to represent data in terms of truth to scientific reality — a task of enhancement that brings its own challenges, as Elkins[12] notes. All these kinds of images only indicate formal properties of the data, not the direct effect of the data on the human retina if an observer had been in range. So the colours used for that kind of work depend on human choice since the technicians

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[11] Michael Lynch and Samuel Edgerton, "Aesthetics and Digital Image Processing: Representational Craft in Contemporary Astronomy," in *Picturing Power*: *Visual Depiction and Social Relations,* Gordon Fyfe and John Law (eds), London, Routledge, 1988, pp. 184-215.
[12] James Elkins, *Six Stories from the End of Representation, Images in Painting, Photography, Astronomy, Microscopy, Particle Physics, and Quantum Mechanics 1980-2000,* Stanford, Stanford University Press, 2008.

represent something that could never be seen with the naked eye, or, at least, not in the form the data was received.

Lynch and Edgerton (*Ibid.*) discovered that there are some naturalistic elements to the very loose conventions the astronomers choose for their art-style images — for example, in one option, blue and black represent dark sky, while saturated reds, whites, and yellows indicate intense sources. Another naturalistic option is to arrange colours into the spectral sequence from red to indigo and violet, in which case red depicts long wavelengths and blue denotes X-ray or similar sources.

Cameras in space only record in certain wavelengths, meaning that the NASA scientists and technicians are interpreting what is received into colour sequences. Hubble records in black and white. Hubble technology then applies colour filters to the images and transfers the black and white into simple colours like red and blue, a process succeeded by another stage when the astronomers enhance the results with further colours. For the composite images of the Carina nebula (**fig. 5**), for example, the Hubble images recorded wavelength intensity in black and white, while the colour filters used were supplied in images taken by a ground-based telescope in Chile. As explained by Zoltan Levay[13], the team lead for the Office of Public Outreach at the Space Telescope Science Institute in Maryland, the colour choices today are less naturalistic than 20 years ago. Blue, he says, represents high energy objects like stars in formation, while lower frequencies tend to be recorded in red. The final result in the Carina is a mosaic of many exposures from multiple points of view with colour information supplied from terrestrial telescopes).

So we can see that colour is only an analogy for representational accuracy, which is by definition malleable. How one defines naturalism in this digital reconstruction is open and strongly determines the final aesthetic.

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[13] Zoltan Levay, presenter, How the Hubble Space Telescope's stunning colour photographs are created – video on The Guardian's internet site (accessed July 3, 2014).

As Lynch and Edgerton discovered and Elkins (*Op. cit.*) reiterated, scientists talking science to scientists use non-aesthetic criteria to compose their images. In everyday understanding of the term, however, the technicians do use an aesthetic to produce pictures intended for the public rather than science. Such astronomical "pretty pictures," as the scientist-artists modestly termed them, were not aimed to reflect real physical quantities and couldn't always be used for accurate science. Instead these "pretty pictures" were qualitative and aesthetic. In contrast, the technicians believed that the quantitative work they did calculating values for professional work was outside the realm of aesthetics.

Elkins (*Op. cit.*) takes the discussion much further. In his opinion artistic traditions originate from painting and photography. The space imagery topic is enriched by his observations linking it to wider aesthetic histories. He avoids imposing one interpretive framework on both science and art or applying artistic criteria to all scientists' visual outputs. Instead he respects the different languages of humanities and those of scientific analysis and speaks of images in whichever set of terms is favoured by the discipline itself.

The Aesthetic of the Sublime

Central to his critique of space images is the doctrine of the sublime, taken from Burke[14] and Kant[15]. Elkins' (*Op. cit.*) main point is to refute astronomical imagery as being sublime, either in its popular forms or its purist manifestations of scientific imaging for scientific purposes. "Outer space just does not mix — at least not yet — with the central themes of painting." He takes Kant's Mathematical Sublime as the most pertinent argument in favour of the sublime aesthetic — but it is worth first considering, as he does, Burke's

[14] Edmund Burke, *A Philosophical Inquiry into the Origin of Our Ideas of the Sublime and Beautiful*, Oxford, Oxford University Press, 1990.
[15] Emmanuel Kant, *Critique of Judgement,* Oxford, Oxford University Press, 2007.

own eighteenth-century version of the sublime and its contrast with "the beautiful."

For Burke, the sublime in art evokes monstrosity, terror, and infinity. It conjures the strongest human emotions based on "obscurity," which arises from the indefinite and powerful emotions of fear.

> Power is undoubtedly a capital source of the sublime - that's where its energy is derived (p. 65).

W. J. T. Mitchell[16] clarifies Burke's innovative role in arguing against classical aesthetics that depend on proportion and form. Instead, the sublime is located in pain, in the unrepresentable, the insensible and mysterious.

Burke's stress on difficulties of comprehension and what lies outside representation are amplified by Kant. Definitions of the sublime in the *Critique of Judgement* (*Op. cit.*) depend on terms and associations that belong to his century. Since space imagery is "nature," the following statement summarises one of his lines of argument: The sublime is:

> The absence of anything leading to particular objective principles and corresponding forms of nature, that it is rather in its chaos or in its wildest and most irregular disorder and desolation, provided it gives signs of magnitude and power, that nature chiefly excites the ideas of the sublime.

Both Kant's dynamic and mathematical sublime are discussed by Elkins (*Op. cit.*). As he records it, the dynamic sublime is the appreciation of a contrast between powerlessness before nature of the human physical body, and the parallel knowledge that the mind lets us think, providing a different and reassuring kind of knowledge, which offsets the horror of the direct physical experience. In the dynamic sublime, there are thus mingled feelings of horror, paralysis, loneliness, and comfort. Elkins is more interested in Kant's mathematical sublime.

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[16] Mitchell, W. J. T., *Picture Theory, Essays on Verbal and Visual Representation,* Chicago and London, University of Chicago Press, 1994.

Elkins suggests Kant's mathematical sublime might help understand space photography — its connections to the ideas of infinity, of magnitude, and consequent feelings of awe and fear within the unstable boundary when the grasp of an idea transfers from intuition to cognition. This state of uncertainty and fear is triggered by difficulties with sheer immensity, and vastness beyond intuitive grasp. The best the human can do before such incomprehensible magnitude is to capture it in an intellectually contained category, such as infinity. However, that containment is only a transitory interlude. The next phase is to realize that the human ability to provide a mental tool for comprehension, such as the concept of infinity, succeeds only giving a short-lived relief, before one realizes that the word infinity does no justice to what is really being attempted: Words and concepts defy the vastness of the experience, reawakening a kind of vertigo. "That is the sublime — a pleasure that comes from displeasure — the displeasure of realizing that the imagination has been, and always will be, defeated." (Elkins, *Op. cit.*:29). Kant calls himself the sublime a "negative pleasure."

These ideas of the sublime entail the breakdown of interpretation and failure of imagination. Elkins' fascination lies in what is unrepresentable and he turns to astronomy to provide cases of extreme doubt — at the far limits of our ability to derive meaning by scientific means from visualized informational traces. To complete that task, he disdains 'pretty pictures'. He proposes his own iconic qualities to analyse space images, such as *blur*, the *ruined grid,* or *darkness*, each of which enables descent down *a ladder of disorder* where the bottom rung is outside knowledge, experience, or recognition. He repeatedly indicates how strange the astronomical world is:

> People talk about the behaviour of gases in nebulae by analogy with jets and bubbles in fluids but there is nothing in human experience analogous to a neutron star or black hole (p. 94).

He analyses images from gravitational lensing, where the correspondence with faint visual traces of a lensed galaxy are compared with predictive equations,

and with ever increasing magnification or enhancement to achieve comprehension. As he says: "What is at work here is not an abstract Kantian infinity but a set of particular observations and equations," which leads to "a real mathematical regime of interpretation, without the sublime, and without infinity" (p. 91).

The Hubble Deep Field (**fig. 6**) — the attempt to see beyond galaxies into deepest spacetime — is so strange that familiar galaxy shapes break down, presumably under operations of physics during unusual conditions of the early universe. Elkins probes the philosophical and material realities of the almost black visual space in the Hubble images, between the deepest and earliest galaxies where interpretation has deep fragility and is "confusion-limited." By the end of the discussion of astronomy he has descended the metaphorical ladder to the point where there is nothing left to look at in these pictures: "The object has departed."

For the most detailed, and exhaustive connection of space imagery and the sublime, the recent work of Kessler (*Op. cit.*) decisively places Hubble imagery in the long Romantic tradition. Her work traces the explicit ties of space photography presentation to the inspiration of the American versions of the Romantic sublime. The artists of the Hubble Heritage Project acknowledge their own debts to the romantic genre and to specific artists, which Kessler (*Op. cit.*) traces out through comparisons of Hubble photos with typical pictures of the genre. She shows how the hues chosen for Hubble images reflect the colours used to depict the landscapes of the American West, the yellows and oranges of the rocks. Blue, reminiscent of sky, is often placed at the top of the photos. The physical forms, the austere and strange pillars, or sheer cliffs and buttes, present a series of iconic forms that provide a familiar vocabulary on which the space art imagery consciously and unconsciously draw. Dramatic clouds in romantic painting prefigure the amorphous shapes in the cosmic realms. They already hold symbolic power as icons of ambivalence, marking boundaries between realms, and between the familiar and the alien.

Light is used in the iconic *The Pillars of Creation* to provide three-dimensionality, just as in Romantic landscape painting, exploiting contrast to secure a sense of depth and recession. She believes the way the space photos are oriented, rarely having north as top, is decisive proof of the artists' desire to provoke landscape associations in the spacescape. Paintings like Bierstadt's *A Storm in the Rocky Mountains — Mt. Rosalie* (**fig. 7**) and Moran's *Chasm in the Colorado* (**fig. 8**), painted in the late nineteenth century, draw upon a reservoir of familiar tropes for public reception. On her reading of Kant's sublime, where, to qualify, the sensual appeal of an image should induce disturbing rational activity, she traces a recurrent theme of the sublime through spacescapes and artistic image processing. She re-names it the "astronomical sublime." It has to be said that her reading of Kant is not identical with Elkins' and is rather more linked to popular conceptions of Romanticism. The requirement of both Kant and Burke (*Op. cits.*) for the sublime to produce displeasure and terror is less emphasized by Kessler. The underlying point here is that, Elkins apart, Romantic aesthetics are shown to be a salient part of the production processes and inscribed meanings of a certain class of space photography from telescopes and space cameras.

Space Photography Online

News values — which I will argue are linked to aesthetics — are a measure of what defines the public appeal of website content. Images are abundant in this magazine-style genre of journalism, especially in the *Guardian*. It is unusual if the website's six top space stories — the ones near the top of the screen — do not have a picture with a distinct aesthetic appeal as well as ones that are topical. In print news nothing like such a prolific number of beautiful pictures have previously been reproduced.

The attraction depends on colour intensities, light, and form, so the screen perhaps does better justice to their attractions than newsprint reproduction. The pictures' spectacular qualities and variety of forms seem to

strike a public chord, not just in journalism. Some reactions are visible in the comment sections of websites, and in many cases are led by a suggestive word or phrase in the headline "heavenly halo," "stunning," and "beautiful."

The vocabulary of analysis of many of these "beautiful" shots can indeed be taken from the historical legacy of the romantic sublime. Births of stars, explosions of unimaginable intensity, gargantuan flows of charged particles across half a galaxy, storms on the gas giant Saturn, black holes swallowing stars, all these represent extremes of physical potency not found on earth and that break down our powers of representation, such is their scale. Power, Burke's primary condition for the sublime, seems to be fulfilled. Mystery, ambiguity, darkness, uncertain meanings, insecure explanations — these qualities abound.

Infinity stares at us from shot after shot of photo galleries reproduced in the news websites, especially those of the *Guardian* and *Cosmic Log*. Even though usually the images have some conceptual explanation, these are often so huge they beg the question of the unimaginable. They depict states of starry matter from billions of light years into the past that also show grand ideas such as the ultimate fate of our universe. By positing the boundaries of the finite, they invite contemplation of the infinite, so the limits of knowledge are implied, and, to use Burke's term, the imagination is confounded.

Of course, in everyday words, these emotions are all too often expressed in website comment sections in clichéd terms — "awesome," "breath-taking" — and some are indeed uncomplicated responses. The eighteenth-century sublime, by contrast, has an absolute quality that includes unmediated, pristine awareness and the ensuing shock of an overwhelming terror and wonder. The modern expression and experience is qualitatively changed from the nineteenth century reaction to specialist art. As Elkins (*Op cit.*) maintains, the true sublime is limited to a period. It is fanciful to expect it to transfer directly to 21st-century consciousness. Nevertheless there is an intermediate position. To be sure, modern experience has a postmodern

element of déjà vu, numbness, and repetition, and with many genres of imagery, we have been around the block several times already. There is, even so, something of the same sublime qualities of Burke's descriptions that are apparent in "pretty pictures," at least a formal similarity and alignment with his terms — of vastness, wonder, obscurity, invocations of infinity, and what in modern usage would be called awesomeness. Cultural memory and reinterpretation over time allow forms and traces of structures of reaction received from the past to persist, even when they are recognized in neither the same words, nor identical feelings, and that is what is happening with popular space imagery and traces of the sublime.

If we move to Kant's *dynamic* sublime rather than the *mathematical* sublime, the possibility of reading today's space images on news websites with his species of the aesthetic seems tenable. The images stimulate encounters with infinity, as described. They also foreground the comforting power of intellectualism, the ability of the mind to distance itself from the paralyzing impression of raw natural phenomena. However threatening the physical events may be, there is an escape provided by mental contemplation, especially since these phenomena are truly so extraordinarily distant in time and space.

There is even some primitive comfort, rather than terror, in the fact that space is shown to have form at all, that there is order, albeit barely recognizable even when translated from the invisible spectrum into optical objects. This is where the sublime argument may be stretched, because unlike witnessing a storm at sea, where the observer is physically at risk, with few exceptions the space imagery by definition is spectacularly remote.

The sense of order brings into question the role of information. To abstract the qualities that add to appreciation of the images, it is worth considering the role of knowledge provided by text about the pictures because few of these abstract depictions are truly denotative — they are not in Barthes' terms, a message without a code. The explanation of what they are can be extraordinary and one that challenges intuitive understanding. It is crucial to

their cultural impact and value that they do represent physical phenomena, however convoluted the process of representation may have become through technologies of image processing, false colour and enhancement. Fact and context form essential parts of the interpretation. This enigmatic example in a different context might be taken to be a close-up shot of an intestine (**fig. 9**). It is a study of the Magellanic Cloud.

The scientist-artists provide composite assemblies to conform to our classifications, such as the idea of galaxy, dust cloud, or at a more basic level, objects like asteroids, or processes like "jets" and "bubbles" or "mountains." They bring a message, crudely speaking, of truth and evidence that forms an integral part of image appreciation.

So much for the much reproduced class of blurry, mysterious images[17] found on the websites, whose forms are suggestive to the imagination, hovering between form and chaos, and between solidity and nothingness. A second species of artistic imagery of space, with a long history in astronomical writings and visualisation, concerns images that are sharply defined, and precisely geometrical, like the planet Saturn taken by the spacecraft Cassini (**fig. 10**).

The wonder that they elicit seems connected to a different aesthetic that is linked to perfection and perfect form. They do fall under the generic term of beautiful — but appeal to a faculty of idealization. This aesthetic is classical, the one that began with the fascination in the Renaissance period with geometry and three-dimensionality. The style of imagery does not have the same novelty value as the Hubble-style products because the geometrical aspects of heavenly bodies have been visualised since the development of telescopes. What recent space imaging has achieved is an impressive expansion in the quality of the visions, and range of objects and shapes to be depicted (**fig. 11**). The effect is both warm and chilling. There is comfort in the

[17] See the gallery on The Guardian's internet site.

realization that regularity and even "beauty" are woven into the fabric of spacetime. The view may provide only cold comfort, but the vision is anything but chaotic or, you might argue, alienating. They are familiar earthly geometries transposed into the sky. They connect with the positive enlightenment views of the mechanical regularity of nature, the world of the poet Alexander Pope, and thus to an aesthetic which is still very much alive in popular photography. Such photos are not sublime: they can be fully comprehended.

So much then for the most aesthetic of the space images, those that the websites seem to include primarily for their so called beauty, many of them consciously constructed by NASA artists with that goal in mind.

The Various Forms of Space Imagery on Websites

Not all doctoring is for one purpose. For example, much less "beautiful" shots of spacescapes are photoshopped for wide public consumption. The rather dull "mountain" visible near Curiosity's landing site on Mars was given an artificially blue sky, like earth, when the real sky colour on Mars is more orange and yellow (**figs 12a and b**).

Yet another provocative set of space pictures that have potent imaginative ring for the public are the direct shots of earth from satellites or space stations (**fig. 13**). These shots of earth can excite expressions of wonder and humility especially when combined with some social event like "Christmas Day" in the headline. On the *Cosmic Log* site, one admirer commented:

> What a simply gorgeous view of our stunning planet. Though we have come so far in many areas of science and knowledge, we are no wiser in the ones that matter most, learning to be more compassionate and peace-loving.

Thoughts of one shared planet, fragility, and of a united human destiny are commonly associated with the backward view from satellite towards earth. The sense of awesomeness is undeniably present, but it is not sublime. In these shots, aesthetics meet ideologies and create suggestive associations of thought and feeling often centred on conservation. As Zoltan Levay told Elizabeth

Kessler, his hope in editing the shots was that they would engender a new regard for the terrestrial world. A similar ideological framework is discussed by Parks[18], in relation to the *Digital Earth Project*, a U.S.-funded initiative to make space imagery available to the public. She suggests the project transfers space imagery from military hands to civilians and moves the Earth-from-space images into a realm of civic engagement, but in her opinion the whole earth vision is falsely sanitized and given a saccharine tone of supra-world tourism.

Indeed, the metaphors of the tourist and tourism can be extended to interpret several categories of space image-making, not just 'earth-from-space' photographs. The whole construct of "natural beauty" aside from the sublime, has a long critical history. A recent discussion is given in the aesthetic criticisms of Adorno[19]. Deploring the bourgeois narcissism of the temperament that appreciates nature, Adorno (*Ibid.*) asserts the art world misrepresents nature as being "tamed," because raw nature, if truly encountered in a non-sanitized version, would depict:

> Mountains of debris from which the socially lauded aesthetic need for nature flees. Just how industrial it looks in outer space will someday be clear (p. 68).

In literal terms it didn't turn out so industrial as he expected. The visualization industry has never depicted space as comprising dereliction of any kind or an insult to the eye, but his argument would be that the exchange relationship has poisoned reactions to unmediated nature, and in this case the whole aesthetic armoury of spacescapes. As he says, the unmediated experience of nature has been subsumed to the exchange relation represented in the phrase *tourist industry*. "The essence of the experience of nature is deformed" (p. 69) so that even to appreciate natural silence has become a rare privilege to be commercially exploited.

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[18] Lisa Parks, "Satellite and Cyber Visualities," in *The Visual Culture Reader* (2nd ed) Nicholas Mirzoeff (ed) London, Routledge, 2002, pp. 279-291.
[19] Theodor Adorno, *Aesthetic Theory*, Minneapolis, University of Minnesota Press, 1998.

Empirical support for such basic tourist sentiment occurs in online comments. A view of Saturn close-up in *Cosmic Log*

> is so beautiful that it literally made me get teary eyed. I just wish we could figure out a practical way to send humans out there to see that in person. We need a warp drive. Otherwise, it just won't happen (*Cosmic Log: March* 2013).

Another commentator applauds "stunning images of Saturn's delicate rings as never seen before look so real, *one wants to reach out and touch them*" (*Cosmic Log*: March 2013). This materializing wish and crude tactile intention falls into the realm of exchange relationships and commodification.

While the tourism interpretations and commodification can be applied to many instances, including photographic work of astronauts as proxy tourists, a further theme of imagery links to fetishism of technologies, such as this photo of the International Space Station above earth (**fig. 14**). The aesthetic combines idealisation and technology fetishism. Stark clear outlines of floating apparatus, typically etched in light against a dark background of space, glamorize the technological object. Moments captured of spaceships docking seem to diminish the hostility of the neighbouring environment while incarnating a fusion of science fact and fiction. These are delicate high-definition wonders of space technology and digital communication combined. They evoke tropes of progress and scientific power that allow the public a vicarious pleasure in achievement and a chance to share technological opinions about the spacecraft systems. Kessler (*Op. cit.*) ties them to the "machine aesthetic" of modernism. Similar echoes of such glamorized visions are captured in artists' illustrations of space vehicles before they are complete. The aesthetic is visionary as the photos celebrate of the extensions of senses through instrumentation.

Faculty of Pleasure

If one part of the visualization of space activity appeals to a faculty of pleasure, there are others celebrating other kinds of information or fact. The

websites in this discussion publish many space images whose primary intent is not aesthetic — they include images containing a variety of information, of human endeavour, of significant events such as the docking of private companies' craft or Russian Soyuz rockets with the International Space Station. Some are of pure science, such as space geology, astronomy, cosmology or images linked to unsolved mysteries like the nature or origin of dark energy or dark matter — questions of astrophysics.

The images link some conventional news values, displaying the human factor, or being timely, and fitting the news cycle (rocket launches and arrivals), or being in some way portrayed as *sensational* as an act of discovery (Hansen, *art. cit.*).

Few of the image categories are really discrete. There are five themes separating the still images: These are: a) aesthetically pleasing pictures of space objects/events and b) pictures relayed for their scientific significance, as *evidence*. They are denotative, showing rock surfaces, asteroid surfaces etc., which need little interpretation. There are, then c) quite different human social pictures, such as astronauts in space (**fig. 15**). A fourth type d) depicts events in space as human technologies in action (dockings, launches, Shuttle movements, satellites) and a fifth category e) is of events that are non-human, such as sunspots erupting. The latter sort cannot be deciphered without considerable explanation. This close-up of the sun could be anything (**fig. 16**). Text is paramount in interpretation of many space events and visual material.

The sentiment of awe is often entwined even with the dullest depiction, as is the case of the "self-portraits" of the Curiosity rover set in arid Martian terrain. They exact admiration through definitional power and human achievement.

The Place of Videos

Videos form an integral part of online space journalism — in the case of the *Guardian* and *New York Times*, a slot for them was structured into the

page layout at the time of sampling. Of the analysed sample, they are least frequent in *Le Figaro*. They can be separated roughly into those that directly record physical happenings — dockings, launches and rocket returns, or unique astronomical events — and didactic explanatory videos about technology or physics[20], or ones that simulate a satellite's purposes and journeys, or that elucidate physical or astronomical processes. Examples of the physical type are of a parachute flapping in Martian breeze, or a collision of an asteroid with a planet. For explanatory stories, you can see replications of collisions with high velocity bits of space junk. Often they deploy still images and graphic simulation. Videos include much less primary evidence than the static camera imagery and show fewer scientific shots and observations than from telescope images and those of cameras. Perhaps this is because they are not part of pure scientific work. The explanatory videos include standard broadcast formats — packages, with voice to camera, interviewees and interwoven footage or images. Their purpose is to illustrate processes or planned space mission events such as computer simulations of NASA's plan to catch an asteroid. They rarely connect directly to aesthetics, but work within a theme of familiarization of space that connects it to the popularization of science. Somehow, the exotic or sublime characteristics of space are comparatively slight in this medium.

A special type of video features the astronaut as author. Such a being becomes a kind of citizen astronaut. The prime example is Chris Hadfield, who was in 2013 heading the International Space Station team in space. His videos are personalised didactic stories about his life and observations inside or from the space station, sometimes aimed at a child audience. One shows the procedure for brushing your teeth in zero gravity, and another tells of the most hair-raising moments he can recall in space. He is, in a sense, a proxy journalist — a citizen journalist from space, having power of direct witness and

[20] Ian Sample, "What is the Higgs Boson?" *The Guardian*, July 3, 2012, (accessed July 3, 2014).

experience and exploiting a unique vantage point. His videos personalize space, so the imagery acts to familiarize the extra-terrestrial environment. His eye-in-the-sky advantage has its limits: he is still no nearer astronomical events in light year terms!

A less vivid case is of an amateur video that showed four seconds of an astronomical body hitting Jupiter. Stories, stills and videos from amateurs (or citizen journalists as they might now be termed) are rare, only about two percent of the total web content, but it is notable they attract untypically large numbers of Twitter and Facebook shares.

Although relatively new to the newspaper armoury of depicting space, it is hard to see many of these videos as especially innovative — their format gives them a terrestrial feel, especially since they are often constructed in conventional ways of terrestrial broadcast. The news values of topicality are paramount, but not so much those of wonder, surprise, discovery, or aesthetics. They do not resonate within the imagination in the primary way that some still images do — as, since they rarely portray points of astronomy directly, their mediation is not transparent, but apparent. There are ten times more still pictures than videos viewed on these sites, if you include picture galleries.

In terms of numbers, it's fair to say there are more pictures online than are ever recorded as being the case in print journalism. Because of picture galleries, the statistics show many more pictures included online than text stories. In itself this fact suggests that picture value, the value to news of the illustration or representation, is becoming more salient. It has to be reiterated that the majority of illustrations are of rockets, however, and the focus of the story is not first and foremost the picture.

Conclusion and Summary

This article has reviewed how to categorise and interpret space imagery in journalism and how some of the pretty pictures can be interpreted by reference to cultural history and art history. It has also discussed how public interest is aroused through aesthetic and ideological connotations of the images.

Visionary optimism tends to govern much of the journalistic outlook on space news and imagery, driving the public towards admiration for adventure, forms of machine worship, and exploration. Pictures tie into romantic tropes of the beautiful, into ideals of technological purity, of new beginnings, of the romantic pioneer, and of the urge to be freed from impurity and pollution. This optimistic ideology, scorned by Adorno (*Op. cit.*), is assisted by the familiarizing images of space, and the interpretations of the pictures of inert matter into friendly earthbound terms.

These sentiments often amount to a pleasure of cognitive dominance of humankind resulting from space exploration. In contrast to the trivialization of humanity in sublime concepts of vastness and human feebleness, space images also permit notions of human hubris of achievement. This is why, even where the sublime, a negative pleasure, does seem to operate, there is paradox since such sentiments sit alongside positive reactions to discovery and dominance.

Images are valued also because they extend scientific knowledge. Still images and videos provide insights into terrain, surfaces, clouds and so on, or present the unexplained, or enigmatic behaviours of matter. Pure astrophysics, in the language of physicists, is almost totally absent. Images act as a bridge between scientists and the public, and within that it is aesthetics that provide the active ingredients in the human responses. Although news values suggested by Hansen such as "surprise" and "weird and wacky" criteria may apply, these labels do nothing to explain why the public is attracted to imagery. On the other hand, by looking at aesthetic traditions, reasonable assumptions can be

made about pleasure. The sublime enshrines Romantic tropes that help explain popularity, already having much modern currency in popular and psychedelic art, and so do classical aesthetics of geometric form associated with modernist purism. The artist Mondrian thought there was nothing more perfect and economical than a space rocket launch. In terms of sociological theory, news values for this branch of science popularisation need the addition of aesthetics. Public engagement with scientific activity is fostered by the visual idioms that scientists choose in presenting their work on space.

The Internet medium itself is greatly helping the communicative effort not only in journalism but through offshoot media like Facebook. On the ideological side one might conclude, like Kessler, that the mentality of Manifest Destiny and the frontier is active and working through the Romantic traditions and the sublime. Many composites of starscapes fall into this bracket. At the same time, ideals of conservation and environmental conservation operate through another set of space images.

Turning to the role of the medium, online journalism allows more pictorial matter to reach the public. Except perhaps for the *New York Times*, the imagery is a vital element of news display, sometimes becoming the reason for the image inclusion. Without the visualisations, much space "news" would surely be excluded. Whereas in print the relation of image numbers to text was at most 100 percent, for online, there are far more pictures than unique stories. The storytelling with pictures is enriched with an explanatory force in multi-media formats that was never available to single media outlets.

While some pictures link to some conventional news values, first of all, these have to be adapted somewhat to suit space terminologies and realities. So the prime value of "proximity" as a news criterion is still often apparent just the way it is for general news. However, crucially, its subject is no longer person or nation, but proximity or relevance to *earth as a whole*. In the same vein, whereas humanization and "relevance to everyday life" are markers of Hansen's values for news in general, in space the issue is whether there is life

or potential for life at all. The news values are thus in both cases taken to a wider degree of generalization. The topic of extraterrestrial life is the one that connects most with the news value of controversy. The normal expectation of negativity in news values is reversed for this kind of science representation, for which the dominant sentiments are positive.

As to the journalists' ideals of objectivity and truth-telling, these terms have to be nuanced in space. Independent verification is not an option for the journalist as a visual observer. Evidence is confined to scientific evidence and does not serve to decide rival versions of social and political truths and ideologies. As noted above, the witnessing function of the image is conducted for space journalism by outside agents and technologies.

For the sociology of journalism, one can conclude that the online environment has followed a trend of the "turn to the visual" noted by the art historian W. J. T. Mitchell. In permitting space to so many forms of image, online journalism is widening its appeal as it broadens and breaks down its own genres. For the sociology of news values, the argument is that for space imagery, aesthetics need inclusion, although the very complexity of cultural realities within the term aesthetics argues against the usefulness of a single word define appeal. It is the particularity of aesthetic traditions that connects science imagery with a public, whether it be sensibilities cultivated through modern or popular art, or through older traditions of classical proportion, or the Romantic Sublime in its latter day form.

In parenthesis one must add that the importance of text in space sciences is paramount — images initially depend on meanings written by website workers but taken from some form of scientific authority, even though the overall effect of the appeal of the image can transcend the scientific interpretation. To know that a Hubble Deep Field photo shows the furthest distance so far attained in the universe is essential to its appreciation. Likewise, although the online visualisation does provide significant drama, which is the drama of spectacle, it is only a marginal human drama (in that all knowledge

acquisition is potentially dramatic), and rarely one based on conflict. Drama results from aesthetic power or the familiar narrative of science in extending knowledge boundaries, rather than being directly linked to human risk, danger, and fate. The knowledge of science is often depicted as being removed from the concerns of everyday life. In public consumption, the imagery is exotic and mostly escapist.