

Capturing Heaven

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Key Words

Visualisation

Summary

We have all seen the spectacular images that the *Hubble Space Telescope* and other such observatories have revealed to the world. Their haunting splendour inspires and compels us as artists. But how can we capture the elusive essence of space in our own work?

Simply put, how does one draw space? To answer this question, it is necessary to move beyond the details of “How do I do such and such in Photoshop?”

I'll say this right up front: this article is not going anywhere near the raw techniques needed to create celestial art. I've discussed this with a number of colleagues, and we've all agreed that the process of self-discovery and learning is a priceless experience. I have no intention of giving anyone the temptation of a shortcut, as I really believe it does more harm than good — providing a crutch and inhibiting an artist's ingrained confidence from developing. The main reason I've written this article is because I dearly love space and all its potential beauty. I also highly respect the community and would like to give those who care to take the time an insight into my own understanding of the elements of space.

To begin, I offer this kernel of knowledge...

Understanding the concept is paramount

The secret to drawing space is to have an intuitive understanding of it. Whether this understanding is the result of research and observation or some spontaneous inspiration, you really must know your subject. A thorough grasp of software and a decent assortment of tricks up your sleeve are important, of course, but even more important is the ability to think about space on a

level deeper than simply looking at a *Hubble* image and trying to copy it. You need to be able to appreciate what space is, physically and aesthetically, in order to represent it in a manner that really does it justice.

That being said, I'd like to share with you some of my own research and insights into space. I realise that some of this is common knowledge. My aims are merely to open your eyes and mind to the sheer potential of celestial art, and then sit back and watch what you create.

Stars and space

As Carl Sagan put it, “A galaxy is composed of dust and stars — billions upon billions of stars.” It's true, space is not as dark as one might think. In fact, it is often far brighter than anyone imagined, a tapestry of shadow and exquisite lights, a dimensional fabric with a subtle texture of brilliance, stretching back in layer upon layer, plane upon plane.

Points of light with maybe a twinkle here and there, stars can seem fairly unremarkable at



Figure 1. Prominence on the Sun. Credit: NASA/ESA SOHO.

first. Closer analysis, however, reveals that stars are not boring in the least and in fact play a vital role in celestial art. Whether they are seen up close or from afar, these luminous pinpricks provide two crucial elements in a scene: a sense of depth and a source of light. When combined with a healthy dose of variety, stars can convey fathomless depths. Similar to looking into a lake and watching the Sun reflect off particles in the water, stars recede in layer upon layer of tiny specks, diminishing in size and visibility as the distance between themselves and the viewer increases. A simple glance at the night sky illustrates this point, revealing also that not all stars are created equal: they vary in size and composition according to their nature. Like a crowd of random people, the sky reveals stars of different masses and in different stages of their lives.

Taking a closer look, the specks of light lose their innocent purity. At close range a raging tempest is revealed: a roiling ball of fusion, light and energy that is held together only by the tenuous balance between energy released and gravity retaining. Suddenly that pinprick of light has a fiery presence and personality that demand recognition. A look at the Sun illustrates this nicely, and easily dispels any notion that stars are simple, perfect spheres of light. Sunspots mar a surface of churning texture, and solar flares leap out into space. The Sun is a caged beast, with a fury unmatched.

There are many different types of stars, broadly categorised by their colour and size. The colour of a star is determined by its temperature, a result of the ferocity of its fusion reactions and often in direct correlation to

the size of the star itself. Red stars are generally the coolest in temperature, and white or blue stars are the warmest. Our Sun, for example, is a midsize yellow star, apparently quite common and with a moderate temperature. Like other stars, it is a collection of gases that exist in a state of perpetual turmoil, a giant, ongoing fusion reaction held together by its own gravity. It is our constant friend and benefactor, providing light and heat in a curiously opportune balance that has allowed life to flourish on Earth. When it reaches the end of its lifespan (in several billion years), it will probably swell to become a red giant for a brief time... a stage of development that will result in the incineration of the inner planets, including Earth. At the end of this stage, it will then collapse in on itself to become a white dwarf, eventually burning itself out. This represents a generalised life cycle that most stars will follow, save for those stars that have huge amounts of mass. These may go out a bit more dramatically, with the cataclysmic event known as a supernova, and leave a slowly fading splash of light and colour known as a supernova remnant.

Stars can also be community dwellers. This means that they exist not only as singular specks in the depths of space, but in clusters and galaxies as well. It is also possible that they will not always be shining through pristine space. Some stars may live ensconced within a haze of dust, others amidst full-fledged planetary nebulae. Others fall victim to dark matter (called dark for a reason, apparently) and are partially or even completely obscured. Each star tells part of a story, and together they weave a scene as fully expressive and emotive as any landscape or character study.

That covers the purely physical nature of stars; how they are used in art is a different matter of study altogether. As a source of light and energy, a sun can be an amazingly benevolent character. Stars can be peaceful companions in a night sky, or glittering treasure in pockets of light amidst a diaphanous nebula. Imagine stars as a handful of brightly glowing dust; the uses for such an amazing element are endless, as is the wonder one can evoke in a viewer if they are used well.

Planets

The quintessential characters of celestial art, planets are often both underdeveloped and undervalued. More than just a spherical *cliché* in a celestial scene, planets are jewels of creation and provide a story all on their own. A view from space reveals a tremendous saga of biology, geology and meteorology. Clouds, coastlines, mountains, lakes, rivers, volcanoes, craters, storms... the list of



Figure 2. Galaxy NGC 3310. Credit: NASA/ESA/HUBBLE Heritage Team.

Stars have been and always will be an important element of space. In point of fact, you don't see a whole lot of celestial artwork without them. They always seem to be included in some form or another, like some unspoken prerequisite for a space image, and can be used as anything from a simple texture to a major character in a scene. Such amazing versatility is not to be taken for granted. It is always worth taking the time for a little experimentation to learn — to know — how you can use these luminous characters in your art and do them justice. One thing you see very rarely is a space image that is only space, only stars. Very few people have taken the time to perfect such a piece, as most are used to seeing stars as merely a task on the road to a larger goal. Personally, I think that stars are worthy objects of study all by themselves, and that there is seldom anything as beautiful — or as peaceful — as a view of deep space filled with stars.



Figure 3. Earth. Credit: The author.

Etymology: Middle English *planete*, from Old French, from Late Latin *planeta*, modification of Greek *planēt-*, *planēs*, literally, wanderer, from *planasthai* to wander.
Merriam-Webster's Collegiate Dictionary

possibilities goes on and on. What's more, planets can easily play multiple roles in celestial art, functioning as an actor in a scene, an extra detail, or even the subject of the piece as a whole. Defined by their sheer size and penchant for detail, planets are essentially enormous layered spheres. Each of their layers encompasses a system of immense complexity and an endless opportunity for detail and exploration.

A look at satellite imagery of our own planet (Figure 4) reveals that, as an artist, nature tends not to disappoint. Each spherical layer on Earth, from the multifaceted atmosphere down to the land and sea, is teeming with detail and activity.

And the Earth is not alone: even the gas giants in our Solar System are permeated to their very depths with detail. A close examination of Jupiter, for example, reveals



Figure 4. Phytoplankton blooms in Fox Basin, Canada. Credit: NASA/VISIBLE EARTH

that, while not possessing a visible ground surface, it is imbued with layer upon layer of colossal and chaotic weather patterns. The Jovian skyscape is rent with lightning, dominated by rank upon rank of towering cloud formations that utterly dwarf their terrestrial cousins. All of this is visible from space, and the largest storm system a planet can produce could very well be no more than a minor detail in the scheme of things. This is the entity known as the planet, not those annoying rendered texture balls that many think they are. A planet is a creation that, when done properly, will convey endless levels of detail from the prominently visible all the way down to the merely implied.

As interesting as they are, it also pays to remember that planets are not always alone. In fact, it is quite common to see them accompanied in their orbits by one or more moons. These often barren brethren are also repositories of exquisite detail, albeit perhaps in fewer layers than the planets if the moon is without atmosphere. But moons carry different elements that may be lacking on a planet — details of their interaction with other space elements: craters, cracks and

fissures. All of these things (which may or may not survive the wear of time or weather on a planet surface) tell of the devastating power of impacting asteroids, meteorites and comets. Whereas a green planet with water and air may tell a story of teeming life, a barren moon displays its alternative, opening up the imagination to all sorts of cataclysmic scenarios. Of course, there can be an element of the dramatic without fire and ice (so to speak). Moons are, by their physical as well as aesthetic natures, perfect balances for a planet in a scene. This makes them “free agents” of a sort, extremely welcome to any composition, but not entirely essential.

More than anything else, planets represent endless possibilities. They are more than a simple texture, more than a glowing orb. Planets are alive, and like any other element of space, deserving of a composition that does full justice to their undeniable beauty and appeal. Incredible visual entities that they are, however, planets are more often than not represented in art as a shaded circle or a simple textured sphere. The idea that a multifaceted, infinitely complex planetary body can be meaningfully distilled down to a simple sphere with a texture mapped onto it is, in a word, obscene. That's akin to saying the elegance of engraved and polished silver can be obtained by wrapping a rock in aluminium foil; it doesn't work that way. Planets are treasure troves of natural splendour, able to carry an image in their own right or provide elegant context as needed. To waste such an artistic element by not taking the time to realise it completely is a terrible loss. A good planet is both a joy to create and a wonder to behold.

Nebulae

Tangled constructs of dust, gas and light, nebulae are among the most beautiful and erratic of space phenomena. These glowing expanses of ionised gases and dust can easily be one of the most enjoyable and free vessels for artistic expression. Beyond a reasonable adherence to physics (often better considered than ignored) nebulae are surprisingly open to interpretation. Since most people have only seen them through



Figure 5. Crop from Crescent. Credit: Michael Ward (shirosynth.deviantart.com).

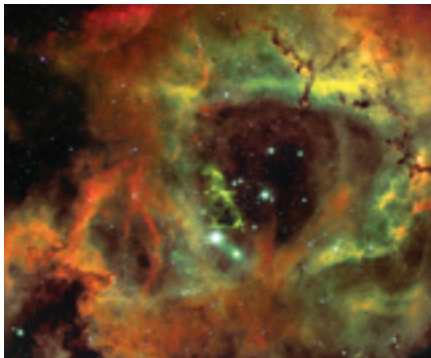


Figure 6. The Rosette Nebula. Credit: T. A. Rector, B. Wolpa, M. Hanna (AURA/NOAO/NSF).



Figure 7. The Orion Nebula and Trapezium Cluster. Credit: Mark McCaughrean (AI Potsdam) et al., ISAAC, VLT ANTU, ESO.



Figure 8. The Helix Nebula. Credit: NASA, WIIYN, NOAO, ESA, Hubble Helix Nebula Team, M. Meixner (STScI) & T. A. Rector (NRAO).



Figure 9. Reflection Nebula in Orion. Credit: NASA/ESA Hubble.



Figure 10. The Bug Nebula. Credit: NASA/ESA Hubble.

It is important to note that when the term "light" is discussed here it may transcend the visible spectrum. Since many of the images seen in popular media are created from X-ray or even infrared observations, the term "light" is stretched to cover any energy that can be construed as a lightening element when translated through artwork.

the lens of false-colour photography, just about anything can be made believable — and thereby even more spectacular — with a decent level of detail and at least a nod towards their physical structure. Surprising to some, nebulae are more than just a splash of colour in the night sky. Their very existence is due to intricate interactions between their component parts, a subtle dance of light and energy that results in several types of nebulae. There are many ways to classify these luminous structures, most commonly based on their physical properties or manner

of creation. When thinking about them in terms of art, however, a schema that broadly classifies them based on how they deal with light (see box) seems more appropriate.

Emission nebulae

Emission nebulae are luminous entities composed of energised gases. The highly charged state of the gases depends on their surroundings; either the stars near them are exciting the gas in some fashion, or the nebulae themselves are the result of an event of magnitude. Supernova remnants, for example, are emission nebulae, and are usually some of the most exciting in terms of colour and vivacity. When a dying star of sufficient mass collapses inwards in the final stages of its death throes, it sometimes erupts in an explosion known as a nova, or in the case of more massive stars, a supernova. Material is hurled forth in this process, spreading out



Figure 11. Region N11B in the Large Magellanic Cloud. Credit: NASA/ESA Hubble.

in a wave of highly energised gas. The Helix Nebula is a good example of this (see Figure 8). The Rosette Nebula is also an emission nebula, but also a supernova remnant, a glowing cloud of gas heated by nearby stars to an excited state.

Reflection nebulae

Reflection nebulae, as the name implies, are visible largely due to the reflection of light from their dusty components. Often seen as ghostly apparitions in the sky, reflection nebulae are absolutely fantastic for alluding to depth and volume. Unlike the charged gases in emission nebulae, reflection nebulae deal with their component light sources up front, constructing fantastic inner spaces



Figure 12. Keyhole Nebula. Credit: Nathan Smith (University of Minnesota), NOAO, AURA, NSF.

that are lit or in shadow depending on the position of their light sources. These nebulae are the most dramatic and awe-inspiring of the three because, unlike emission or dark nebulae, they are literally edifices in space, spanning millions upon millions of miles. They are the cumulonimbi of nebulae. One such example, the Bug Nebula (Figure 10), is particularly dazzling. With its wildly energetic veils of light and rich golden hues, the Bug Nebula looks like it would almost be more at home in a renaissance painting rather than in space. On the other end of the spectrum, they can also be the cirrus clouds of nebulae, wispy and diaphanous, like the Reflection Nebula in Orion (Figure 9). This incredible range makes them immensely interesting and, in terms of composition, incredibly versatile subject matter.

Dark nebulae

Dark nebulae are the shadows in space, veils of dust and assorted matter that, rather than reflecting or emitting light, block it entirely (but not uniformly). The Horsehead Nebula (Figure 13) is a perfect example of a dark nebula, its eerie silhouette a sharp contrast to the brilliantly lit gases surrounding it. Whereas the two previous nebula types have celebrated light, dark nebulae celebrate its absence, making them at once both



Figure 13. Horsehead Nebula. Credit: NASA

When I draw nebulae, I never sketch or plan beyond the most whimsical of lines. I prefer not to define them if I can at all avoid it, instead preferring to let them evolve as I work. No one technique for creating them has ever gained my fancy, and no one type of nebula has ever reigned supreme as “THE nebula for the serious space artist” (a silly consideration to begin with, why limit yourself?). In my experience, nebulae grow, based on playing and deciding for one’s self what works for the given composition, truly a gut creation if I ever saw one. And they take time. This is a subject that looks as if it would be fairly easy to create, but oddly enough isn’t. If it were, everyone would be doing it and succeeding brilliantly (which isn’t saying that some people aren’t succeeding brilliantly). Simply put, if there was a quick and easy way to make incredible nebulae, we’d see a lot more of them. But there’s more to a nebula than the techniques of its creation. They should tell a story, because in real life each and every one does just that. Take, for example, planetary nebulae. Most often composed of dust and the raw materials for life, these variants of reflection nebulae organise around a star or a system of stars. The story of the beginning of a solar system is there for the taking (or illustrating), and is far more interesting than a simple splash and smear affair that is concerned solely with “looking like space”. The human race has long looked at the stars and been in awe, but history maintains that we didn’t peer into the night sky for a good show so much as to derive meaning. To look at space any other way is merely skimming the top of a rich subject with the potential to give so much more.

foreboding and enigmatic. These curtains of dust are, by their very nature, alluring, their presence leading viewers to wonder, “What’s behind there?” When used with sensitivity in an image, they can provide a powerful boost to the mood of the piece. In another light (no pun intended), they rule supreme as the ultimate element of contrast.

Light

Light flows. Like water, it can gush, bubble, meander and swirl. It functions as a tangible substance, even though it is physically anything but. Light is the crucial element in a piece, able to make or break it depending entirely on the ability of the artist to wield it effectively. As the key element (an important idea in the inherent darkness of space), light is something that every artist should study and attempt to understand. It is by far the most dynamic element of celestial art — or any other art for that matter — and those who master it stand out from the rest with works that exhibit a potent vibrancy.

How light behaves depends largely on the medium it is reacting to. Energised gas, for instance, emits its own light, and so, by extension, becomes light in of itself and has no limits to what it can do. The dust and matter of a reflection nebula, on the other hand, are a little less free, if only by physical definition. Here the light is far more expressive



Figure 14. Crop from Etherlight. Credit: Gary Tonge (www.visionafar.com).

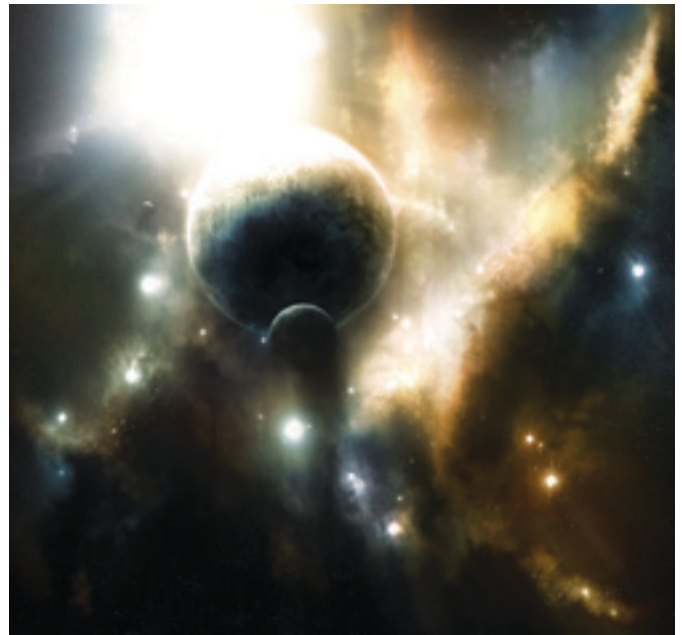


Figure 15. Crop from Euphoria Mod II. Credit: The author.

in the form of streams, rays and shadows. A column of dust, for example, may have rivulets of light curling about it as wisps of dust farther from the main mass escape its shadow to catch light on their own. A thin cloud of matter may also allow crepuscular rays (also known as “God rays”) of light to flow past, streaming out like a holy beacon. Gary Tonge captures this beautifully in his painting, *Etherlight*. At the other end of the spectrum are simpler light reflections. Planetary surfaces, for example, may reflect light while their atmospheres refract it in such a fashion that they glow brilliantly.

It is important to note also that light is not a two-dimensional creature. Highly receptive to changes in depth and volume, light can be used to emphasise or exaggerate either. A cavern of nebulous dust could become even more dynamic than it is in a merely physical sense by the addition of light (in the form of glowing stars) throughout. Shadows can throw contours into sharp relief, deepening the visual impact of such a structure. A veil of glowing dust between the viewer and a planet can emphasise not only the size of the planet, but its sheer presence and dimensionality as well, drawing attention to the formal contrast between the dust and the magnificent glowing sphere. The list could go on and on — the possibilities of light are endless.

The physical nature of light, too, is something to consider. The luminosity of a light source can provide direct focus for a piece, as it is very hard to ignore a properly rendered (drawn) light of brilliant intensity. The quintessential dawning of the Sun over the Earth would be decidedly lacklustre without the telltale flare and diffraction spike, elements that can be used elsewhere to indicate extreme brilliance

far more tactfully than an overexposed glare of white and colour. It has become common to denote brightness by merely upping the levels in a paint program, washing out the object to the point of whiteness. This is not the way to go about things; the best way to show that a light source is incredibly bright is, first, by how it interacts with the subjects of a piece (reflection) and, second, by how it would look to a viewer via delicate diffraction spikes and possibly a subtle flare (see above, right). It is also important to note that a camera flare is easily recognised, and too many of these stand out in a glaring fashion. It is a nice tool, no question about that, but like many filters in paint programs, best used as part of a more refined process and not as a singular means to an end.

The final and most important element of light is its incredible importance to the mood of a piece. Mood plays an important role in the success of the planet and dust veil example mentioned earlier. An excellent example of lighting to affect a mood can be seen in

Light is incredibly important to art. Unfortunately, many people are too caught up with the “how” to understand the “why”. There’s no easy answer to how one creates and controls light in a scene beyond simply taking the time to understand it and get a feel for it. For a long time, light has been a particular fancy of mine, an element that I seek to control and harness for the betterment of all my works. I don’t know why, but the idea of a truly immersive image is so incredibly appealing to me that I find myself working towards that goal in everything I do. Light is an essential key to this, the final piece in setting up a truly dynamic environment. Despite the many years that I’ve been playing with it, I’ve not yet fully mastered light. The only way to learn is to do, so I’ve been practising and improving over time. I urge everyone to do the same.

Brandon Hale’s *Incandescence*. The image, while simple in its subject matter and technique, is extremely effective in conveying a mysterious, almost brooding mood. The light coming from above makes the planets and moons almost aquatic in nature, as if some higher illumination was shedding light upon a community of celestial bodies. Gary Tonge’s *Havona*, also uses light effectively, both as a focus for the piece and to create a feeling of sheer awe.

The impact of a piece is directly related to how effectively it is lit, because one of the main draws for such an illustration is the pervasive mood of mystery and awe that the scene would evoke in real life. This holds true for almost any scene, making it all the more important to understand light and how to use it.

Final thoughts

You may ask what all the fuss is about regarding understanding space. You may think to yourself, “I can always follow a tutorial and get the results I need.” In return, I ask you this: are you truly your own artist if you do this, Or are you an extension of the tutorials that govern your creations? Thanks to cookie-cutter tutorials and walkthroughs (which I am at least in part responsible for), the realm of celestial art is now a horrible *cliché* inundated by artists and dreamers who cut corners to get their shiny, mass-produced results. Only a dedication to complete, utter and exquisite excellence will make this genre respectable again. I’ve hinted at this decline throughout the whole of this article (and tried not to be overbearing, since I’m just as responsible as any for the fate of this genre), but the message is of



Figure 16. Flare and diffraction spike example. Credit: The author.



Figure 17. Incandescence. Credit: Brandon Hale (absolutehalo.deviantart.com/).

paramount importance. Space is dying. As a realm free from restraint or rules save those that we make for ourselves as artists, it has suffered the blows of ready-made filters, plug-ins and campy computer-generated shortcuts like none other. I suppose the thing to remember is that, no matter what anyone says, those cheap derivations of space will probably always be there. It is the responsibility of the serious artist to govern his or

her own efforts, to exercise discipline and to learn respect for the truly awesome topic that we strive to represent and do justice to.

So much of art isn't the program you use, but the understanding your exhibit through whatever you create. The differences between the images created off the cuff or after copious research are dramatic. Personally, whenever I attempt a project without a firm footing in the subject at hand I flounder — badly. I can only imagine how other artists feel about this subject, but for me, to draw something you must know it intimately. In this, an open mind and open eyes are your best tools. Many tend to forget that observation and research are part of the job of being an artist, and that careful analysis — both in terms of the medium (programs) and the physical nature of what is being created — can yield answers far more illuminating than any tutorial or step-by-step instruction.

The road to understanding something can only be travelled by your own two feet. Your personal style and the insights you bring to a subject through art are what make your creations different from anyone else's. Ultimately, that's what keeps art interesting. Certainly, that's what keeps art alive.

I hope this has been some help. Now it's time to draw...



Figure 18. Havona. Credit: Gary Tonge (www.visionafar.com).

Biography

An artist admired by many astronomy communicators, **Greg Martin** lives in Portland, Oregon. He has been drawing ever since he could pick up a pencil or crayon, and made the transition to computers as his primary mode of artistic expression around 1995 or so. This transition was inspired largely by the fact that it is fairly difficult to draw celestial artwork in pencil or paint (although many have done so with spectacular results). The computer seemed to be a perfect tool for it, and space became his "gateway" into digital art.

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