

Visualising Astronomy: The Astronomical Image, Part One

Ryan Wyatt

California Academy of Sciences
E-mail: rwyatt@calacademy.org

Key Words

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Ask for an image to sum up visualising astronomy and most people think of an iconic Astronomical Image. By which I mean the glamour shot that appears on the glossy magazine cover or is enlarged to greater-than-human size to grace the wall of an art gallery or science museum.

Who isn't a fan of the latest, splashy *Hubble* or *Spitzer* or *Chandra*? Astro eye candy with crisp details psychedelically rendered from narrow band filters or wavelengths our eyes can never see... Don't we all just gobble up every swirl and sparkle? Aren't these images the reason the astronomers become astronomers, rather than physicists, poring over loopy particle tracks or dull plots?

The Astronomical Image provokes an aesthetic response that helps engage a variety of audiences. With the recent opening of the *Hubble* exhibition at the Walters Art Gallery¹ and similar exhibitions taking place or planned for IYA2009 worldwide, the "art" angle has obviously met with a certain high- or middlebrow recognition. As we attempt to capitalise on the public outreach potential,



Figure 1. *Mountains of Creation* from the Spitzer Space Telescope reveals structure that we automatically recognise as naturalistic. Credit: NASA/JPL-Caltech/L. Allen (Harvard-Smithsonian CfA).

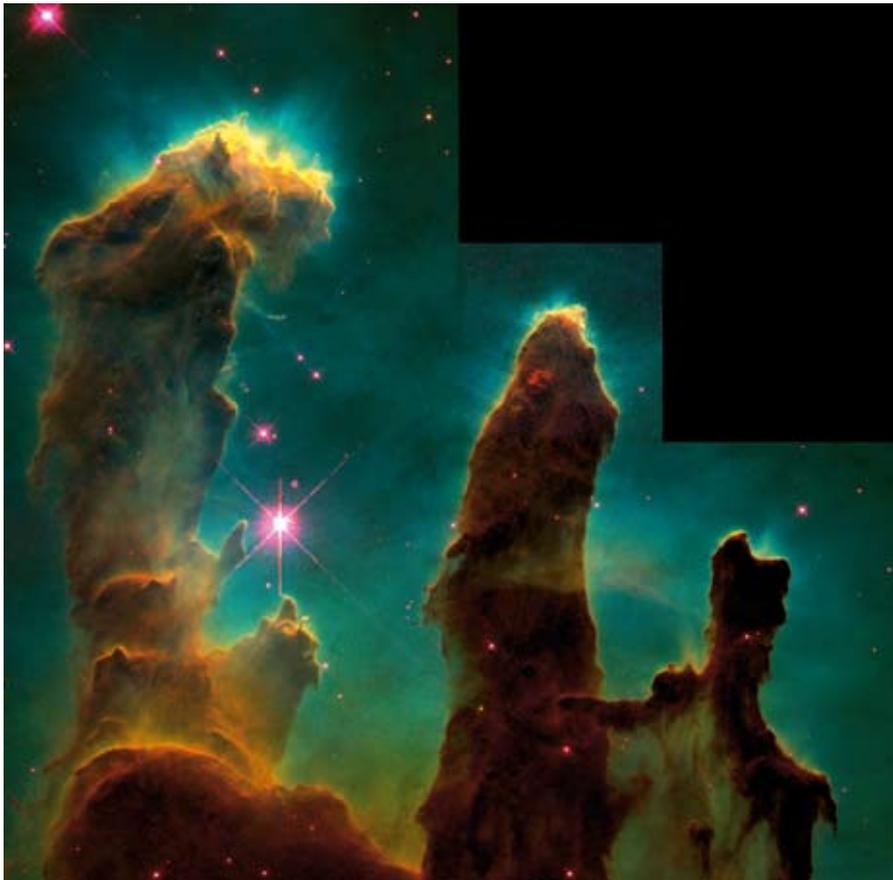


Figure 2. An old friend, the Pillars of Creation image takes advantage of our inherent response to warm and cool colours to enhance its three-dimensional appearance. Credit: Jeff Hester and Paul Scowen (Arizona State University), and NASA/ESA.

we should take a moment to consider the quality of people's aesthetic response.

In her study of *Hubble* imagery,² doctoral student Elizabeth Kessler compared *Hubble* imagery to paintings by members of the Hudson School, such as Albert Bierstadt or Thomas Moran: "The *Hubble* images are part of the Romantic landscape tradition — they fit that popular, familiar model of what the natural world should look like."

I suspect that part of the appeal lies in an intrinsic quality of the images themselves, namely the image statistics that underlie what we perceive to be natural images.³ Real-world images contain structural information over a range of scales that communicates verisimilitude. Both the "Mountains of Creation"⁴ of *Spitzer* (Figure 1) and Moran's "The Teton Range"⁵ communicate something topographic that results from the manner in which the overall scale relates to its cragginess. Similarly, many high resolution astronomical images lock into our innate sense of what reality looks like. For much the same reason, I have long advocated the use of real data in planetarium presentations: the result simply looks more authentic than artwork and provokes an associated affective response.

It would be disingenuous to suggest that the naturalism and the appeal of an image can be reduced to a power spectrum. Take a look at the *Hubble* image that could be said to have started it all: Hester and Scowen's narrow-band interpretation of M16, dubbed the *Pillars of Creation*⁶ (Figure 2). I know you will have seen it a million times before, but take another look. The warm oranges and yellows of the intricate pillars seem to reach out at you from the cool, almost aqueous background. This is not a new idea to visual artists — Leonardo da Vinci wrote in the 15th century: "You know that in such an atmosphere, the most distant objects, such as mountains, appear, because of the great quantity of air that lies between them and your eye, as blue as the air when the sun rises." The highly unnatural colour scheme in the *Pillars of Creation* results from assigning [OIII], H α and [SII] narrow band images to blue, green and red channels respectively — but the resulting image happily capitalises on our sense of depth perception to give it a sense of dimensionality it would otherwise lack.

A must-read for anyone interested in the use of the Astronomical Image is Rector et al. (2007). Although the bulk of this lengthy article is devoted to techniques for manipulating digital images, it also touches on a philoso-

phy of presentation in the abstract: "The use of visual grammar, defined as the elements which affect the interpretation of an image, can maximize the richness and detail in an image while maintaining scientific accuracy. By properly using visual grammar, one can imply qualities that a two-dimensional image intrinsically cannot show, such as depth, motion and energy. In addition, composition can be used to engage viewers and keep them interested for a longer period of time."

Amen. What they are saying is simple enough: give people what they want, and make it work for you!

But this gives us only half the aesthetic picture. There is something else our images have in common with the 19th century paintings of the American West: the sense of exploration. The Romantic landscape would not have existed without something to romanticise; similarly, the impact of the Astronomical Image relies on its looking outward to the Universe around us. More on that in my next column.

Notes

1. *The Aesthetics of Hubble Images Showcased at Walters Art Museum*, STScI Press Release 2008-10, available at <http://hubblesite.org/news-center/archive/releases/2008/10/full/>.
2. *Astronomers interpret Hubble images in same majestic light as early painters of America's western landscapes*, University of Chicago Press Release, available at <http://chronicle.uchicago.edu/050303/hubble.shtml>.
3. Ruderman, Daniel L. 1994, *The statistics of natural images*, Computation in Neural Systems, pp. 517–548, available online at http://mplab.ucsd.edu/~marni/lgert/Ruderman_1994.pdf.
4. *Spitzer Captures Cosmic Mountains of Creation*, SSC Press Release 2005-23, available at <http://www.spitzer.caltech.edu/Media/releases/ssc2005-23/index.shtml>.
5. Available online at <http://artbarplayers.com/art/detail.php?ID=15616> and also from the Metropolitan Museum of Art at <http://www.metmuseum.org/>.
6. Hester, J. & Scowen, P. 1995, *Embryonic Stars Emerge from Interstellar 'EGGs'*, STScI Press Release 1995-44. <http://hubblesite.org/newscenter/archive/releases/1995/44/text/>

References

- Rector et al. 2004, *Image-Processing Techniques for the Creation of Presentation-Quality Astronomical Images* Available online at <http://arxiv.org/abs/astro-ph/0412138>.

Biography

Ryan Wyatt is the Director of Morrison Planetarium and Science Visualization at the California Academy of Sciences in San Francisco, California, USA. He writes a quasi-regular blog, *Visualizing Science*, available online at <http://visualizingscience.ryanwyatt.net/>.