

The Art of Planetary Science

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We are living in a truly remarkable golden age of planetary exploration. We've just about completed the preliminary reconnaissance of all the major (and many minor) planetary bodies in the solar system (we'll have Pluto and Ceres 'in the bag' in the next few years), and we've made follow-up trips to several worlds to seek answers to new questions raised by our first encounters. In a couple of cases, we're now several missions in to detailed characterization of local environments and focused investigations of specific features and phenomena. What's more, we now know that we live in a Star Trek universe, rife with planetary systems of all variety around many, perhaps even most, stars in the galaxy. Christian Huygens and Carl Sagan are smiling.

The science and engineering of exploring our planetary system, and indeed all other astronomical phenomena beyond, has usually been preceded by someone's artistic imaginings and renditions. Art and science have been close companions in exploration since the dawn of the space age. But this isn't a new or unique partnership. Art has played a role in inspiring exploration of new frontiers and in 'making real' things and places beyond the experience of most people for perhaps as long as humans have been creating art.

One particularly relevant example that created romantic visions of the untouched majesty of the American West is the body of work by a group of artists known collectively as the 'Hudson River School.'



"Jungle Canyon" digital art. For those who might be wondering, the vast majority of the scene was composed and rendered in *Vue*. The plants with the pink berries are one of my *Xfrog* plant species. The planet and moons were made in *Celestia*. Birds (if they're really birds) are a photo element from a digital reference, and all was composited in *Photoshop*. © 2013 Dan Durda.

In the 19th century, artists such as Thomas Cole, Albert Bierstadt, and Frederick Edwin Church captured in their paintings scenes of the natural beauty of American frontier landscapes that, to the eyes of most eastern city-dwellers, must have seemed an Eden-like paradise. Those luminary landscapes in turn drew more explorers and artists and in some ways helped change the way we relate to the natural world around us.

Astronomical Artistic Visions

The genre of astronomical art plays a similar role today. It allows us to see the unseeable and to go places we can't yet reach, or to places (or times) we can *never* get to. Celestial objects and phenomena appeared in Renaissance art, supplemented the scientific documentation of the earliest telescopic observations, and even helped shape the birth of the space age.

In a famous series of articles in *Collier's* magazine in the 1950s, notable pioneers in space science and rocket engineering popularized details of Werner von Braun's architecture for manned space-flight to low-Earth orbit, the Moon, and beyond. Richly illustrated by artist luminaries such as Chesley Bonestell, the "Man Will Conquer Space Soon!" series even inspired three episodes of the Disneyland television show, and provided a generation of Americans with an optimistic vision of human space exploration.

Such artistic visions of exploration and far-off worlds helped pave the road to my professional life as an astronomer (and more specifically as a planetary scientist) when I was still a young child. Interested in all things science, I grew up on television nature documentaries, plus Sears chemistry and biology and geology sets, and I poured through the educational books my parents always had around the house. One particularly influential book, filled with beautiful artists' renderings of celestial wonders, was Time-Life's book *The Universe*. I still have that very book today, its barely connected binding a testament to how often I poured through its pages.

At the time Carl Sagan's *Cosmos* debuted in 1980, I was sure I wanted to be a marine biologist. But the 13 episodes of *Cosmos* elegantly married my astronomical and biological interests, and my fascination with extrasolar planets and the possibility of life on those worlds was re-awakened. The episodes and chapters "Travels in Space and Time" and "Encyclopedia Galactica" captivated me with descriptions of possible configurations of other planetary systems



"Beach 2." This scene is a little reminiscent of one of the hypothetical worlds depicted on page 312 of *Cosmos*. © 2013 Dan Durda.

and speculations on the diverse environments they might afford for a wide range of possible life forms. Find a copy of the book and take a look for yourself at pages 209 and 312. This was clearly a topic near and dear to Carl's heart, and his awe for the wondrous possibilities rubbed off on me. My professional path to planetary science was set.

My Astro-Art Beginnings

My life as an astronomical artist began rather abruptly in 1994, shortly after moving to Tucson, Arizona, to start my post-doctoral studies at The University of Arizona. Tucson was also home to space artist Kim Poor's Nova Space Art Gallery. I had been receiving Kim's catalog of space art prints and collectables for years, but now that I could visit the gallery in person I decided to wander in one day. I was simply awed — there's nothing like seeing original art (in any form), and it was no exception for the magnificent paintings, some well-known pieces I'd admired in reproduction form for years, that I was now seeing with my own eyes. I was immediately hooked. I just



Betsy Smith painting (in a very traditional manner) Ubehebe Crater during an IAAA session in Death Valley National Park, California. Courtesy Dan Durda.

had to see if I could create some of this kind of art myself.

Both Kim and planetary science colleague Bill Hartmann (himself a very accomplished and well-known space artist) were exceptionally generous in encouraging my early (and looking back now, quite crude) attempts at putting acrylic to canvas. As fate would have it, right at the time of my first painting efforts, there was going to be a space art workshop in Utah. Kim and Bill, both

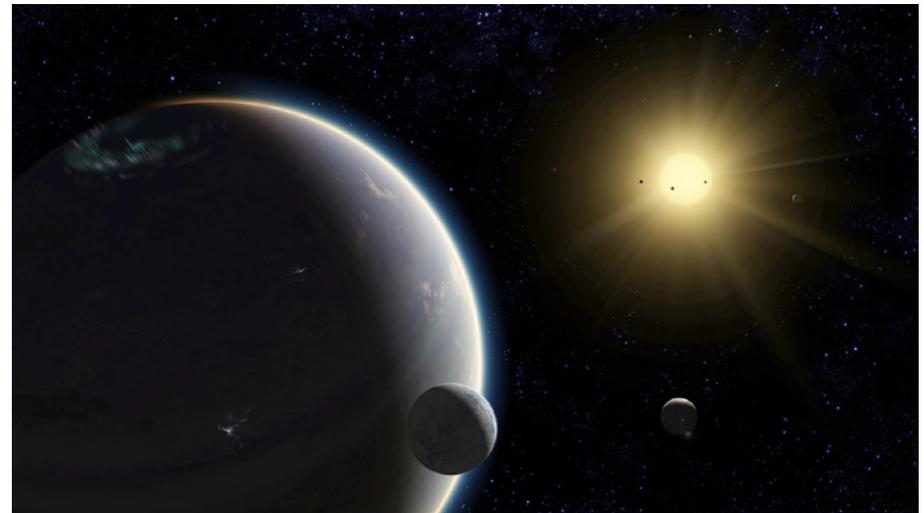
members of the International Association of Astronomical Artists (IAAA), invited me to attend and join the organization.

The IAAA was formed in the early 1980s, when an eclectic group of 19 of the world's most talented space artists came together in the otherworldly environs of Death Valley to share their common passions for space exploration and astronomical art. Since then, the IAAA has held a series of workshops in similarly stunning locales around the world, from Hawaii to Iceland and across the American southwest. These workshops offer us the opportunity to share and learn new techniques, to critique and be critiqued, and, best of all, to revel in the friendship of wonderfully talented kindred spirits. IAAA membership today includes more than 120 artists from around the world, and members' artwork ranges from technically accurate renders of spacecraft hardware to impressionistic nebular swirls.

Blending Art and Science

I'm often asked how one mixes the two lives of professional planetary scientist and astronomical artist. The queries usually begin with some reference to the left-brain, right-brain dichotomy, mixing the technical and analytical with the creative and imaginative. I like to remind the people I talk with that, while the *methods* and tools of science may often be associated with those analytic functions usually attributed to the 'left brain,' the *process* of science, the inspirations and flashes of insight, are every bit as creative a 'right brain' human enterprise as is art. So for me, the marriage of art and science in my professional work and hobby time is as natural as can be.

Indeed, my science and art very often interplay and influence each other. Although my day-to-day research work is now heavily focused on understanding the collisional processes that affect the surfaces of small asteroids, the early, formative influence that *Cosmos* had on me is the reason exoplanets and alien biotas feature so heavily in



If the planet-seeking spacecraft called Kepler can find it, an astronomical artist can paint it. Kepler-11 is a sun-like star slightly larger than the Sun. Its planetary system is one the most compact and flattest systems discovered so far. All six of its transiting planets are larger than Earth, with the larger ones being about Neptune's size. © 2013 Dan Durda.



The late Paul Hoffman performing digital manipulation on an image he shot during one of our IAAA outings earlier that day. Creating art in the digital domain is a very different process than via the traditional method shown on page 3, but the results are equally spectacular. Courtesy Dan Durda.

from applications I learned to use in my digital art and visual effects work. Most generally, I often find that simply by looking at the world around me and the subjects of my research work in the visual context of an 'artistic' approach, I can sometimes make some intuitive leaps that I might not otherwise be able to.

The physical process of creating artwork has changed quite a bit for me over the years. I had no formal education in art, and other than some childhood doodlings, I never really created any artistic works until those first pieces inspired by my fateful visit to Nova Space in 1994. I simply went to the local art supply store and picked out a selection of what felt right at the time — assorted tubes of acrylic pigments and some small canvases and pieces of illustration board — and set out to see what I could do. I did have some experience with an airbrush from my days of modeling military dioramas, and that certainly served me well in my early attempts to mimic the look of some of the amazing space-art pieces I had studied in the gallery.

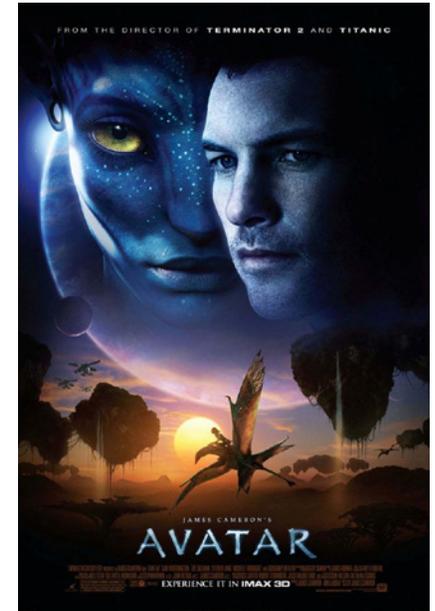
my artwork. I have created a number of pieces to illustrate exploration concepts or astronomical phenomena that my colleagues and I have worked on. Conversely, on several occasions in the last two years, I have been able to apply software solutions to some of my research data-analysis problems

Moving Into the Digital Age

As the years passed, I grew to be able to create some original paintings that I consider, even today, at least passable within a genre of works by incredibly talented artists I never imagined I'd one day just hang out with. Originals sold, I had reproductions published in books and magazines, and I pressed to learn and try to improve. I began to dabble more and more with some rudimentary digital techniques, but for the most part I was pretty happy in my little acrylic world.

Everything changed the night of December 18, 2009. I walked out of an IMAX theater after seeing *Avatar*, and I was almost speechless in awe of the artistic masterpiece I had just experienced. James Cameron and the team of artists who brought Pandora to life had accomplished the kind of photo-real world creation that I had been dreaming of for years. That was it — I just *had* to learn to drive the digital tools used to make this movie, so I could unleash the exoplanet scenes in my head that my fledgling traditional art capabilities were not allowing me to express.

I immediately began to research the various 3D applications used in the digital arts and visual effects industry and set out to learn how to use and apply them to the artwork I wanted to create. More than three years later I am still learning (and I always will be, that's the fun of it!), and I've amassed a growing stable of applications I use every day in my artistic endeavors, including *Vue*, *Modo*, *ZBrush*, *XFrog*, *SpeedTree*, and of course *Photoshop*.



My worlds of science and art may have collided, but the process has been a very creative and productive one. Through this amazingly fun journey, I've come to realize that the two were never really that separate to begin with.

About the Author:

Dan Durda is a Fellow and a former member of the Board of Trustees of the International Association of Astronomical Artists. His space art has appeared in numerous magazines, web news stories, and books and has been internationally exhibited. He is also a Principal Scientist in the Department of Space Studies of the Southwest Research Institute's Boulder Colorado office.



Resources:

- Dan Durda's 3D Impact Gallery: www.3dimpact.com
- The Hudson River School: www.metmuseum.org/toah/hd/hurs/hd_hurs.htm
- Chesley Bonestell: Legends of SF Art: <http://stevelensman.hubpages.com/hub/Chesley-Bonestell-Astronomical-Art>
- Kim Poor's Nova Space Online Gallery: www.novaspace.com
- International Association of Astronomical Artists: <http://iaaa.org> ♦

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