

THE ART OF SCIENCE

The age of digital photography allows astro-imagers to be creative with their subjects.



Each night as the Sun releases the sky to its glittering distant cousins, thousands of telescopes awaken and tip

toward the darkness above, anticipating new discoveries both personal and scholarly. The starlight trickling into these instruments is increasingly focused not into the eye of a solitary observer, but onto the surface of a silicon sensor called a charge-coupled device (CCD). This sensor converts light photons into electrical signals, which then can be interpreted by computers into measurable data and pictures.

Considered an almost perfect detector, the CCD is sensitive to a large swath of the electromagnetic spectrum — from ultraviolet to the near infrared — and is dozens of times more sensitive than the best photographic films. Capable of snagging virtually every photon, CCDs can record the emanations of the brightest stellar objects, as well as those 10,000 times fainter in the same exposure, allowing scientists to peer over 10 times deeper into space than emulsion-based technology. It also produces a signal that is directly proportional to the amount of incoming light striking its surface.

This permits researchers to measure the distance, composition, and speed of space phenomena both nearby and at the limits of telescopic detection.

The need to take nature apart, to understand its constituent pieces, has always been at the heart of scientific investigation. Humankind also has a need to reconstruct what we have learned from nature, to place things in context, and to understand our place within the surrounding universe. Often we accomplish this through art. While some contend that art and science are opposite pursuits, they are more intertwined than most suspect: science informs art, and art helps us make sense of what science has learned; one powers our technology and the other fuels our imagination.

So in the 1990s, when CCD technology became affordable to the general public, some recognized that it could unfetter the astrophotographer to give his or her nighttime pictures a distinctive quality by mimicking many of yesteryear's dark-room techniques using computer processing. This "digital darkroom" allowed the astro-imager to be expressive and unlock aesthetic qualities latent within their digital photographs. As with fine-art photography,

personal perspectives, feelings, and the image itself began to consume the attention of many astrophotographers.

For example, selective filtering can be used to alter contrast or enable the placement of values along a tonal scale. A galactic dust lane could be made to stand out as if backlit against a luminescent background, or subtle planetary features could be shown in enhanced contrast. The depth of the universe could be rendered as a star-spangled, three-dimensional space receding back into an infinite void. Digital photography gave astro-imagers the means to control their medium with the same finesse that painters command using a palette and brush. For



►THE CRAB NEBULA

One of the sky's most popular targets for amateur telescopes, Messier 1 is the remnants of a supernova explosion recorded by skywatchers in 1054.

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this reason, pictures of identical subjects acquire the distinctive style of the photographer, frequently inducing unexpected reactions and occasional gasps from viewers.

Today, astronomical images often represent an individual's opinion, with its own sense of reality that expresses the photographer's personal delight and wonderment about the subject. These images, in turn, have inspired others to embark on their own photographic expeditions of discovery.

Astrophotography is no longer bound solely to the service of scholarly investigations. As many of the pictures filling this magazine bear witness, astro-imagers are making personal discoveries by traveling virtually to the distant places that we could only dream of a century ago. This places astrophotography at the crossroad between science and art, knowledge and creativity; a propellant for curiosity and the art of science. ■

Astrophotographer R. Jay GaBany explores the universe with distant, computer-controlled observatories from the comfort of his home office in San Jose, California.

◀JUPITER'S BLACK EYE

On the evening of July 19, 2009, Australian planetary imager Anthony Wesley noticed an unusual dark spot on Jupiter (upper right). His dramatic discovery captured the attention of amateur and professional astronomers worldwide (see also page 89).

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