

Astrobiology News May 2015: Celebrating the Hubble Space Telescope

In commemoration of the Hubble Space Telescope's (HST) 25th anniversary last month, Space.com presented an article with the curious, but particularly apt, title, *25 Years of the Hubble Space Telescope: A Story of Redemption*.¹ The HST has been a remarkably successful mission, with a long and rocky history. Those of you who remember HST's launch in 1990, may also remember that the telescope had some early problems caused by a malfunction in the device that polished HST's mirror, which resulted in an optical defect known as spherical aberration. What you may not know is that some of the astronomical viewing tools developed to correct HST's vision problems were applied to imaging techniques for early detection of cancer in digital mammography.² The collaboration that led to this technology transfer came about serendipitously, since radiologists and astronomers rarely attend the same conferences! Despite its initial snags, the HST has been pivotal in developing 'Big History'³, telling the story of our cosmic origins from the birth of the Universe to the ongoing formation of stars and planets today.

As a young graduate student in the 1980s, it was my privilege to be part of the last class taught by Dr. Robert E. Williams at the University of Arizona. Dr. Williams is one of those unique counterexamples to the stereotype that the best researchers can't teach well and vice versa. After 30+ years, I can still decipher the notes I took in Bob's class, which is a remarkable testimony to his pedagogical talents! Bob is extraordinary in another respect – he chose to leave a secure, tenured position to explore new frontiers, as it were, including serving as the Director of the Space Telescope Science Institute (STScI) from 1993-1998. Inspired by the first deep images taken after HST's repair in 1993, which revealed many new galaxies, Bob used his Director's Discretionary Time during the Christmas season in 1995 to 'stare' at a very empty, uninteresting patch of sky near the Big Dipper and collect faint light from that patch for about 10 days (analogous to a very long exposure.) The result of that simple idea was the now-famous Hubble Deep Field, which reveals about 3,000 galaxies in a field of view roughly equal to the size of FDR's eye on a dime held at arms length and projected onto the sky. If you have never seen this breathtaking image, or its successors, check it out on the HST site⁴!

The American Astronomical Society awarded Bob Williams the Beatrice M. Tinsley Prize for the Hubble Deep Field in 1998. The Tinsley Prize recognizes outstanding contributions to astronomical research resulting from exceptionally creative or innovative ideas. Bob's simple idea helped fulfill one of the primary motivations for

¹ <http://www.space.com/29223-hubble-space-telescope-25-years-redemption.html>

² <http://ipp.nasa.gov/innovation/Innovation41/HubbleFights.html>

³ <https://www.bighistoryproject.com>

⁴ http://www.spacetelescope.org/science/deep_fields/

building the HST: to measure the size and age of the Universe, and test theories about its origin and evolution. The Hubble Deep Field and subsequent deep fields give us a fossil record of the history of the Universe. Some of the galaxies in these images are so distant that the light we see today originated less than a few billion years after the Big Bang. The operation of the HST is expected to continue through the end of this decade, providing overlap between HST and its successor, the James Webb Space Telescope (JWST), which is scheduled to launch in 2018⁵. JWST will extend HST's legacy by using its infrared vision to peer even further back in time to see the first stars and galaxies forming out of the darkness in the early Universe. Imagine what mind-blowing discoveries might be in store for humanity over the next 25 years!

Until next month,

Grace

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⁵ <http://jwst.nasa.gov/>