The Arrow Of Time: The Movie

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From research labs to classrooms to primetime television, we increasingly rely on pictures to provide insights and understanding not possible through words or lecture alone. Visualization has become a significant part of the scientific enterprise, from deep-space astrophysics to molecular biology. This paper will address the making of a new movie, “The Arrow of Time,” a computer-generated, 12-minute, entirely animated tour of the Universe, from big-bang to humankind. Taking the Universe to be 12 billion years old and running time linearly, one minute of screen time then equals one billion years of cosmic time. Therefore, recombination in the early Universe, when matter and radiation decoupled, occurs within the first few seconds of the movie; the onset of hominids occurs within the final few seconds. Much of this movie, then, is an attempt to capture, in high-resolution, broadcast-quality video the origins of galaxies, stars, planets and life forms. It is a rendering of the epic story of cosmic evolution, from start to present—in effect the temporal equivalent of the classic movie, “Powers of Ten.” The movie was produced at the Wright Center’s Science Visualization Lab. Here, several Silicon-Graphics Indigo, Elan and Extreme workstations operate in parallel, each with 24-bit and 32-bit microprocessors using Alias, Waveform and Maya modeling software. Recording is done on Abelas Digital Discs, output to Betacam-SP tape, using NTSC, PAL, and Seacam formats. “The Arrow of Time” will be continuously shown as part of this paper, which will also highlight the making of the movie, including the trade-offs in scale, color and timing needed to achieve a reasonable balance between the aesthetics of the art and the accuracy of the science.