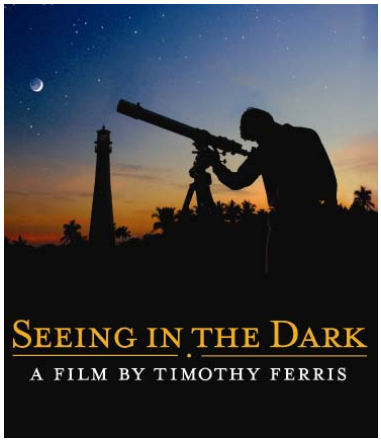

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About the Film

By Timothy Ferris

The way that can be named is not the eternal way.
–Lao Tzu, first century B.C.

The awe-inspiring sight of a sky full of stars can render us speechless — and understandably so. Two very different entities are involved, and they're both rather mysterious.

At one extreme stands the individual observer, peering through a telescope or simply staring up at the stars. To ask who is doing the observing is to raise one of the oldest questions of philosophy. "Know yourself," said Socrates, although he made the mistake of assuming that one had to accomplish this before trying to learn about the rest of the universe. (Rejecting a scientific account of the winds, Socrates said, "I can't as yet 'know myself' ... and so long as that ignorance remains it seems to me ridiculous to inquire into extraneous matters.") Actually, we humans have since learned more about ourselves by studying the wider world — by investigating the processes that created life and shaped its evolution — than we ever did through introspection, and we see those processes written large in the depths of the sky.

At the other extreme stands the wider universe itself, unimaginably vast and yet, as Einstein said, "at least partially accessible to our inspection and thinking." Notoriously indifferent to the human condition, the universe is also curiously involving. We feel that we belong to it, or in it — that the blades of grass underfoot are as much a part of the universe as the blazing stars seen through the eyepiece. We may love this sensation, but as it says in the film, "it can be hard to put love into words." So this is a film in which stargazers try to describe an ineffable experience, and invite viewers to share their wordless awe.

To convey a sense of that experience, we departed from the conventions of science filmmaking in several ways. The first step was to do away with a conventional "presenter." I seldom talk to the camera in this film, since when you go out to look through a telescope you may appreciate a guide's whispering into your ear but you don't want him standing between you and the stars while he gives you a lecture. Our production team also devoted a lot of effort to depicting the stargazing experience in ways that closely replicate the real thing. Our aim was not just to inform our viewers (although we hope we've done that) but to incite them to get outside at night and have a look for themselves. After all, the point of stargazing is not just to see things as others have seen them, but to have an original and memorable experience all your own — even if you cannot describe it all.

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The grandeur of nature on the cosmic scale tends to beggar familiar concepts nurtured here on Earth, and *Seeing in the Dark* is ultimately a meditation, as the final line of the voice-over narration puts it, on "time, music, and the stars."

Time inevitably figures in stargazing, since everything we see in the night sky belongs to the past. This relationship is embodied in the "light year," a standard cosmic yardstick defined as the distance light, moving through the vacuum of space at 186,000 miles per second, travels in one year — nearly six *trillion* miles. We see the Moon as it was 1.3 seconds ago, bright stars as they were decades to centuries ago, and galaxies as they were millions of years ago. To confront light older than the human species and even the Earth may be disconcerting at first — big time, like big space, can make us feel inconsequential by comparison — but in the end it can be oddly reassuring to consider the fleeting span of human life in a cosmic context. We may be only actors strutting on a stage, but the stage is big and the play has been going on for a very long time.

Seeing in the Dark is structured on three contrasting scales of time. On one level, the entire film takes place in the course of a single night at Rocky Hill Observatory, starting just before sunset and ending just after dawn. On a second level, it outlines my own experiences with stargazing, starting at age twelve and lingering on the days when I was around seventeen years old and was observing with fellow members of our rather grandly named Key Biscayne Astronomical Association. My son, Patrick, plays me at that age, then returns as himself at the close of the film, in a dialog that suggests how the accumulation of scientific knowledge can overcome the limitations of human mortality by passing knowledge down through the generations. This dynamic is reprised in the film's other two historical recreations, showing Edward Emerson Barnard and William Herschel in the nineteenth and eighteenth centuries respectively, each of whom got into stargazing as teenagers and went on to make discoveries that continue to inform us today. On a third level the film moves out in space and back in time, starting with nearby planets and then enlarging its frame of reference to take in our galaxy and, finally, the Andromeda galaxy, more than two million light years away — a time frame that encompasses the entire career of the human species.

Music, like cinema, is an art form intimately bound up with the passage of time. A still photo may do justice to a painting or a poem, but you cannot "freeze" a movie or a piece of music and get much out of it. Astronomers have long associated music with the sky — from Pythagoras, who in the sixth century B.C. suggested that an underlying harmony, a "music of the spheres," defined the motions of the planets, to recent work on the internal dynamics of the Sun that liken it to a gigantic gong. *Seeing in the Dark* features two musicians turned amateur astronomers — William Herschel in the eighteenth century and Michael Koppelman today. It also touches on my own involvement in music, which resulted among other things in my producing the gold record carried aboard the twin Voyager space probes. (The Voyagers are now approaching the edge of the solar system, thereafter to wander forever among the stars.) The blues music that meant so much to me as a young man was a kind of time capsule, and the ability of music to answer to the beauty of the night sky in ways that may transcend the scope of words is evinced in the original musical score created for the film by Mark Knopfler and Guy Fletcher.

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The stars appeal to the eye in ways never before rendered so accurately in a film. Their colors (which result from their temperatures), their twinkling (produced by Earth's atmosphere), and the imposing appearance of thousands of stars arrayed across great swathes of the night sky cannot be captured by any existing motion-picture camera, so we drew on a wide range of art and modern technology to bring the stars to life on the screen.

For naked-eye skies we started with the still photographs of Akira Fujii, regarded as the world's foremost wide-angle astrophotographer, then "twinkled" their brighter stars by applying pseudorandom algorithms developed at the digital-processing houses, Form in Los Angeles and Video Arts in San Francisco, and by our special-effects artist, Don Davis. (The digital post-processing wizards started with theoretical models, while Don simply made de-focused video images of Sirius, the brightest star in the sky, then reverse-engineered its twinkles to apply them to the stars in the photos.) Telescopic views of brighter objects such as the Moon and the planets were shot with an HD camera through a large backyard telescope by the astrophotographers Kenneth Crawford and Michael A. Mayda. Dimmer telescopic objects, from star clusters and nebulae to galaxies, were rendered by taking thousands of stills which were then run as frames of motion-picture footage — thirty frames per second of on-air time — or by "twinkling" still images. Here the key contributors were Jack Newton, Mike Palermiti, and our cinematographer, Francis Kenny, who also post-processed the timelapse footage of stars rising over Rocky Hill Observatory that opens the film's final scenes.

Several zoom shots seen in the film would not have been possible a decade ago. The long "pull" on the Cone nebula seen over the Einstein quotation in the Cape Florida beach sequence exploited the high resolution of Rob Gendler's painstakingly assembled wide-sky photomosaic of the Milky Way in the constellation Monoceros. Our long "push" into the Orion nebula begins with a timelapse photo of the entire constellation, shot on a digital camera piggybacked on the 18-inch Newtonian telescope at Rocky Hill, then dissolves into a Rob Gendler mosaic and then into a Don Davis effect in which we fly through the center of the nebula itself. Don's special effects — hovering over the rings of Saturn, moving out among the stars to spot extrasolar planets, witnessing the explosion of a star eleven billion years ago, and flying over the entire Andromeda galaxy — capture something of the "being there" sensation familiar to seasoned stargazers whose knowledge of astronomical objects lets them get the most out of their hours at the telescope in much the same way that a baseball game looks much deeper and more involving to a knowledgeable fan than to a novice.

Stargazing has been a fascination of mine for a half century. (As it happened we started principle cinematography on the film exactly fifty years after I acquired my first telescope.) To do justice to such a beautiful subject, at once personal and universal, I assembled a dream team of creative collaborators. Among them were cinematographer Francis Kenny, who combined his years of feature-film shooting with his extensive experience in high-definition video to explore new visual territories; our editor, Lisa Day, who made the film dance; our cheerful and resourceful director, Nigel Ashcroft, who brought the script to life on location; the sound designer, Kate Hopkins, whose grounding in natural-history filmmaking did so much to draw earth and sky together; and the sound mixer, Walter Murch, a three-time Academy Award winner who threw himself into the project as if it were his first.

In all, more than a hundred people worked on *Seeing in the Dark.* If you like it, they deserve the credit. If not, I'm the one to blame.

-- T.F., Rocky Hill Observatory

Technical Notes: Seeing in the Dark production footage was shot on location in pure 1080p HD video, through Zeiss lenses on low-compression Sony 900 cameras working at 30 frames per second. The original telescopic footage was shot with HD video cameras, computer-controlled timelapse still cameras using full-frame 35mm CMOS chips, dedicated astronomical CCD devices operating at below-zero temperatures, and large-format film cameras. The optics included 24-inch and 18-inch carbon-fiber Schmidt-Cassegrain, Ritchie-Chretien, and Newtonian reflectors plus an array of refractors and traditional telephoto lenses. The audio was mixed in Dolby digital 5.1 surround, incorporating ambient sound captured on location with a solid-state titanium recorder. For best results, try to see it in HDTV on a big screen.