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# Jill Tarter, role model and SETI pioneer

Capturing science as a human endeavor is at the core of *Making Contact: Jill Tarter and the Search for Extraterrestrial Intelligence*. Sarah Scoles's biography deftly and entertainingly tells the story of groundbreaking scientist Jill Tarter, whose work has been pivotal to SETI.

Tarter is no stranger to battles. She was the first woman to receive a degree in engineering from Cornell University, where she completed her bachelor's in 1965. *Making Contact* astutely highlights the nuances and challenges of being a female scientist at that time, a heroic achievement in itself. Tarter's role in inspiring new generations of women to join the ranks of scientists, engineers, and mathematicians is significant. Scoles, an accomplished science writer, acknowledges that Tarter is a personal hero who inspired her own career in science, and countless other women have pointed to Tarter as a role model.

**Making Contact**
**Jill Tarter and the Search for Extraterrestrial Intelligence**
**Sarah Scoles**
Pegasus Books, 2017. $27.95


But Tarter's significance is not just about her success as a woman in science. Occasionally a remarkable scientific mind demonstrates insight beyond that of the collective consciousness and is able to push both scientists and the public in new directions. In my view, Tarter is such a person. Despite widespread public skepticism about the project, SETI is important for humankind. As Scoles puts it, "SETI holds up a mirror, showing us how we look from a cosmic perspective." Tarter has made it her life's pursuit to prepare us—not just scientifically but emotionally—for the answer to whether we are alone.

*Making Contact* tells the story of Tarter's ambition and interminable curiosity and of her fortuitous stumble into the new field of SETI in 1969 during her second year of graduate school at the University of California, Berkeley. A trained engineer and radio astronomer, Tarter found she was not fulfilled by traditional research. She was, however, hooked when she learned of the work of early SETI scientists, and she became determined to pursue a scientifically rigorous investigation into the possibility of alien life.

Scoles skillfully weaves explanations of the science behind SETI into the story of Tarter's life. Her witty style leavens the potentially dry engineering and astrophysics discussions to create a text that will engage both amateur science enthusiasts and the most seasoned physicists. Readers learn about the fundamental principles to consider when looking for life in the universe and how scientists might communicate over vast interstellar distances with today's technology. They also hear about Tarter's first pivotal meetings with Carl Sagan, foreshadowing her role as the inspiration for the protagonist in Sagan's beloved novel *Contact* (1985). The book, and the 1997 film adaptation starring Jodie Foster, made Tarter a scientific star across the globe.

On more than one occasion, Tarter found herself at the center of congressional ideological and budget crosshairs. Readers learn of SETI researchers' head-on collision with the political establishment and follow their fight to save the federal funding line for SETI investigations. After Congress cut off SETI funding in the 1990s, Tarter and her colleagues navigated the waters of private philanthropic financing, a voyage that ultimately led to the launch of the SETI Institute. That tale will seem all too familiar to researchers facing battles over funding today, and such stories are important to document because they show how budget debates can fundamentally alter our collective scientific pursuit.

Although Scoles does not provide a historical account of SETI's origins or

future direction, she does present important episodes in SETI's history through the lens of Tarter's experience. Those include the launch of second-generation SETI searches with Project Phoenix, in which the Parkes Observatory telescope in Australia and the Robert C. Byrd Green Bank Telescope in West Virginia were used to search millions of frequencies for advanced extraterrestrial signatures. Scoles also discusses Tarter's grandest SETI ambition: the Allen Telescope Array. She doesn't shy away from describing the intricate details of the project and the tumultuous financial and experimental road that finally led to commissioning tests and initial observations in 2007.

Scoles also highlights connections between SETI's fascinating research and the broader interdisciplinary science of astrobiology. She stresses that we now know that the universe is teeming with potentially life-supporting planets. That truth, she continues, only bolsters Tarter's determination to find other civilizations in the universe.

Jill Tarter's life is now woven into the arc of SETI history and will be reflected on for years to come. Her story reminds us to keep pursuing answers to pivotal scientific questions, regardless of the ideological barriers. Tarter's life's work has made us better prepared to continue the search for extraterrestrial life and better prepared for actual cosmic contact.

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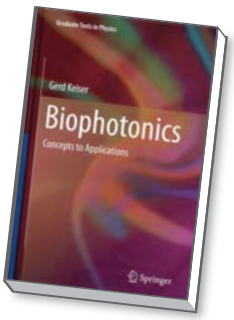
# Biophysical optics in a single voice

**Biophotonics**
**Concepts to Applications**
**Gerd Keiser**
Springer, 2016.
$99.99




Biophotonics, or biomedical optics, is a rapidly growing interdisciplinary field. Its research encompasses optical imaging, spectroscopy, and therapeutics of biological materials ranging in size from subcellular scales to organ systems. Its applications include cancer detection and diagnosis, noninvasive tissue biopsy, functional brain monitoring, image-guided surgery, light-based therapeutics, and microscopies of many types targeting biomarkers in cells and tissues. *Biophotonics: Concepts to Applications*, a new volume by Gerd Keiser, aims to serve as a course textbook for advanced undergraduate and graduate students and to be a working reference for biomedical and biophysical researchers.

Presently, most books covering biomedical optics are edited volumes with chapters on different topics written by different authors. Comparatively few textbooks have been written in a single voice about the whole field. In my view, we need more single-author books, and I enjoyed working through Keiser's text.

The 11 chapters of *Biophotonics* systematically take the reader from underlying concepts about light, including the basic optical techniques needed for most biomedical measurements, to a discussion of light–tissue interactions that carefully builds from basic physics to therapeutics. The early sections set up a series of chapters about increasingly modern advances, including fluorescence techniques, photon correlation spectroscopy, optical coherence tomography and microscopy, linear and nonlinear spectroscopy, interferometry, and optical trapping. In total, the material is covered in less than 350 pages.

Some of the book's sections are more successful than others, which is not surprising given its ambitious scope. I found the three chapters on optical fibers, light sources, and optical detectors to be a strength. These tools are important to the field, and the author guides the reader step-by-step through a