

## Milan M. Ćirković: *The Great Silence: The Science and Philosophy of Fermi's Paradox*

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Milan Ćirković wants you to take the Fermi Paradox more seriously. In his latest book, *The Great Silence: The Science and Philosophy of Fermi's Paradox*, he argues it is in fact “one of the deepest, subtlest, and most persistent challenges in the history of science” (to quote just one superlative-filled passage).

Ćirković brings an encyclopedic familiarity of the professional and popular literature and history of the Fermi Paradox, including important contributions from science fiction. This makes for an undoubtedly scholarly work: its final quarter (over 100 pages!) is entirely devoted to extensive endnotes, impressively up-to-date references, and a (disappointingly incomplete) index.

Ćirković also brings a wide background to the discussion, using a broad range of artistic and popular references to illustrate points (reaching from Lovecraft to Dilbert, from Resnaix to XKCD). The prose is alternately dense (befitting a thorough philosophical critique of the work to date), and forthright, light, and emphatic. The book is lightly illustrated with original and charming cartoons by Slobodon Papavić Bagi, and a few figures from scientific papers and pop culture.

Ćirković coins or endorses many useful categorizations and names: for instance, the things sought by SETI are “sophonts” (better than the usual “alien intelligences”, “ETTs”, “ETIs”, “ATCs”, etc.); the discovery of distant alien technology with no hope of communication is “bare contact.”

This book's forbears include Stephen Webb's *If the Universe is Teeming with Aliens... Where is Everybody?* (an accessible book written for a popular audience using the Fermi Paradox as a way to explore astronomy and astrobiology) and Paul Davies' *The Eerie Silence*

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(which similarly calls for a broadening and redirection of SETI efforts), and Ćirković expands greatly on those books' theses.

But armchair astronomers and fans of Tyson-esque pop-sci be warned: this is not an astronomy book. Though he is an astronomer (PhD Physics and Astronomy from Stony Brook University), most of Ćirković's discussion is actually philosophical in the best sense of the term: he is organizing ideas and interrogating them; identifying logical fallacies and confronting the strongest forms of arguments.

Indeed, there is hardly any astronomy here at all, most of it concentrated in a brief survey of a few important ideas in Chapter 2. Even professional astronomers will find themselves occasionally reaching for a textbook or Wikipedia to track down an unexplained astronomical concept or philosophical argument. When astronomy does come up there is an idiosyncratic focus on a few ideas Ćirković finds to be especially on point, such as Charles Lineweaver's Galactic Habitable Zone, and these are presented without much qualification about the degree of widespread acceptance they may or may not have in the field.

Indeed, this is not even a book about SETI. To Ćirković, even the detection of extraterrestrial intelligent species would be no resolution the Fermi Paradox, because Ćirković's "strong" version of the Paradox asks why the Galaxy is not filled with so many sophonts that they are "no less obvious than the (counterfactual) brightness of the night sky" in Olbers' Paradox.

Ćirković's main exercise is to identify the philosophical assumptions behind the Fermi Paradox (Naturalism, Copernicanism, and Realism) and to catalog proffered solutions to the Paradox according to which assumption they discard. Ćirković helpfully gives playful and evocative names to each solution to help us keep track of them all: for instance he dubs the hypothesis that the last billion years in the Galaxy have been uncharacteristically safe for the development of intelligent life "The Gigayear of Living Dangerously". To Ćirković, modern astrobiology has so demonstrably narrowed our uncertainty in every term in the Drake Equation (such as the rate of abiogenesis) that "Rare Earth" solutions have lost nearly all credibility, and the others do not fare much better under his scrutiny.

Ćirković brings an iconoclastic perspective on to SETI. For instance, he comes to bury the Drake Equation, not to praise it: he finds its "customary" and "ritual invocation" to be "largely an admission of failure...to develop a real theoretical grounding" for SETI. And although perhaps supportive of radio communication SETI in that it is low cost and offers high reward, he declares its "failure" to date to be "a philosophical failure" in that it is philosophically inconsistent even on its own terms. He cheers the recent revival of "Dysonian SETI" (the search for other, perhaps passive manifestations of alien technology in the Galaxy): "The winds have changed," he writes; "the sleeper has awakened."

Most helpfully, Ćirković identifies concrete paths forward that would help resolve the Fermi Paradox and put real constraints on the existence of sophonts. He argues, quite persuasively, that SETI is a long-neglected subdiscipline within astrobiology (the topic of his previous book, *The Astrobiological Landscape*), and these books are part of his larger call for a "general astrobiological/SETI theory" that would allow for real progress to be made on the Fermi Paradox.

Though the intellectual scope of *The Great Silence* is broad and based firmly and both the humanities and physical sciences, the book would have benefited from a more thoughtful engagement with the social sciences. Ćirković's perspective and examples are unabashedly that of a particular secular strain of the Western tradition of the physical sciences, and he is not shy about expressing opinions about other perspectives: there was no astronomy before Galileo; Genesis 1:28–30 is "harmful, Bronze Age nonsense/superstition"; humans are self-

evidently creatures of higher complexity than other species; humans must expand into space and use the resources there “if [we] are to survive as a species”; and (quoting Edsger Dijkstra) “science is hated because its mastery requires too much hard work...scientists are hated because of the power they derive from it.” To Čirković, understanding why we seem to be alone in the Galaxy is the “last challenge to Copernicanism,” which is important because “anti-Copernicanism in one form or another dominates 99% of public life and thought on this planet.”

Strangely, the “resolutions” to Fermi's Paradox that many (perhaps most) SETI practitioners would favor do not merit clever names or places in Čirković's “tournament” of solutions. When emphasizing how *difficult* the Fermi Paradox is, Čirković asserts, almost implicitly and certainly without justification, two questionable premises: 1) that if ancient technological species arose in the Galaxy then at least some of them would have climbed to near the top of Kardashev's scale by now (i.e. their industry would dominate the energy budget of the Milky Way) and 2) that it is “hardly feasible” that the Galaxy could be filled with such technology without us having noticed it by now, unless it were somehow hidden from us.

The latter assumption is especially puzzling given that Čirković makes the issue of *detectability* “one of the crucial concepts of the book” and argues that it cannot be quantified until a (still elusive) satisfactory theory of astrobiology is developed. Indeed, Čirković is fond of repeating a (very true!) quote by Kardashev: “Extraterrestrial civilizations have not yet been found, because in effect they have not yet been searched for.” And this is still true today: even when one considers only the narrowband radio searches that have dominated the field since the '60s, we can hardly be said to have begun to search (though the Breakthrough Listen project has begun to change that).

So let me here add two solutions to the Fermi Paradox to Čirković's list (I look forward to his clever names for them): near-complete Dyson spheres are rare for a combination of practical economic, engineering, and physical reasons; and the Galaxy is not actually “Silent,” we're just not listening.