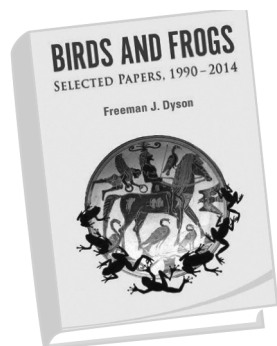




BOOK REVIEW



Birds and Frogs: Selected Papers, 1990–2014

Reviewed by Gerald B. Folland

Bird and Frogs: Selected Papers, 1990–2014

Freeman J. Dyson

World Scientific, 2015, vi+368 pages,

US\$58.00 (hardcover), US\$28.00 (softcover)

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It will not come as news to most readers of the *Notices* that Freeman Dyson is the possessor of a lively and inquisitive mind that is equally at home in physics and mathematics and a frequent visitor to other areas of discourse. A couple of decades ago, two anthologies of his papers were produced: one [1] a collection of his nontechnical articles on a wide variety of subjects and the other [2] containing his technical scientific work. The present volume is a sequel to both of them, comprising a selection of both nontechnical and technical papers (in the ratio of about 3 to 1) from the past quarter-century. The title is appropriated from a delightful article, originally published in the *Notices*, that contrasts big-picture visionaries (birds) with masters of technical detail (frogs).

There is a great diversity of material in this book, and almost all of it makes enjoyable reading. Let me try to give the flavor of it by describing a few of the highlights.

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Photo by Andrea Kane.

Freeman Dyson at a conference titled “Dreams of Earth and Sky: A Celebration for Freeman Dyson”, Institute for Advanced Study, September 2013.

Several of the pieces here draw on Dyson's personal recollections, beginning with a charming portrait of the scientist as a young boy. The memoir on the operations of the Royal Air Force Bomber Command, where Dyson worked as a statistical analyst in World War II, gives an interesting personal view of successes, failures, and moral dilemmas in an important episode of military history. And an account of a brief meeting with Enrico Fermi, in which Fermi politely but firmly told Dyson that he and his students were walking up a blind alley, stands as a model of scientific honesty on the part of both parties.

There are several essays about the lives and work of other eminent scientists. The one that stands out is the memorial article on Edward Teller, one of the more perplexing figures of twentieth-century physics. Teller spent the first half of his career happily collaborating with many others on a wide range of problems in theoretical physics. As Dyson wrote in a letter in 1949, "He has done all kinds of interesting things in physics, but never the same thing for long, and he seems to do physics for fun rather than for glory." But in 1952 Teller moved to the Livermore Laboratory and spent the rest of his career working in relative isolation on applications of nuclear power, both military and otherwise, and expounding hawkish views on international politics. (His testimony against Robert Oppenheimer at the 1954 congressional hearings did much to erode his professional friendships.) Dyson, who knew and liked Teller and collaborated with him on a project to build safe nuclear reactors, gives what seems to me a very fair assessment of this complicated man.

Some of the articles here depart from the territory of physics and mathematics into artificial intelligence, paleobiology and exobiology, and what one might broadly label as "science and society". A couple of them border on science fiction or invite controversy. (In his commentary on "Science in Trouble", an article that elicited a lot of criticism, Dyson notes with satisfaction that he "had successfully gored a number of sacred cows".) My favorite is "The Individual or the Group: A Question That Arises in Science, Law, and Language", which weaves discussions of individual versus group selection in Darwinian evolution, the difficulty of translating the English word "freedom" into Russian, and the Bakke affirmative action case into a single stimulating essay.

There are only eight items in the "Technical Papers" group, but they are a heterogeneous bunch, mostly accessible to nonspecialists. A couple of them are pure mathematics (number theory and game theory), a couple are pure physics, and a couple combine the two disciplines. One of the latter does a neat job of applying ideas from statistical mechanics to derive an approximate formula for the partition function of number theory.

Let me close by saying a little more about one of the physics papers. You may think, as I did, that the first sustained nuclear fission reaction on Earth occurred in 1942 in Fermi's laboratory in Chicago, but that is wrong. It occurred around two billion years ago in Mother Nature's laboratory in Africa, in what is now a uranium mine in Gabon, and it operated for some hundreds of thousands of years. Several people have used data from the remains of that reactor to address the question of whether the strength of the electromagnetic field has changed over the course of time; here Dyson and T. Damour subject these calculations to a careful statistical analysis to confirm that the answer is "no" to a high degree of precision and confidence. One may or may not wish to follow them through the details, but it is fun to watch scientists at work applying intriguing obscure facts to answer apparently inaccessible questions. If you pick up *Birds and Frogs* and browse through it, this is surely not the only place where

you are likely to have the pleasure of learning something new or gaining a new perspective on something old.

References

1. F. J. DYSON, *From Eros to Gaia*, Pantheon Books, New York, 1992.
2. ———, *Selected Papers*, American Mathematical Society, Providence, RI, 1996. MR1390992 (97f:01031)

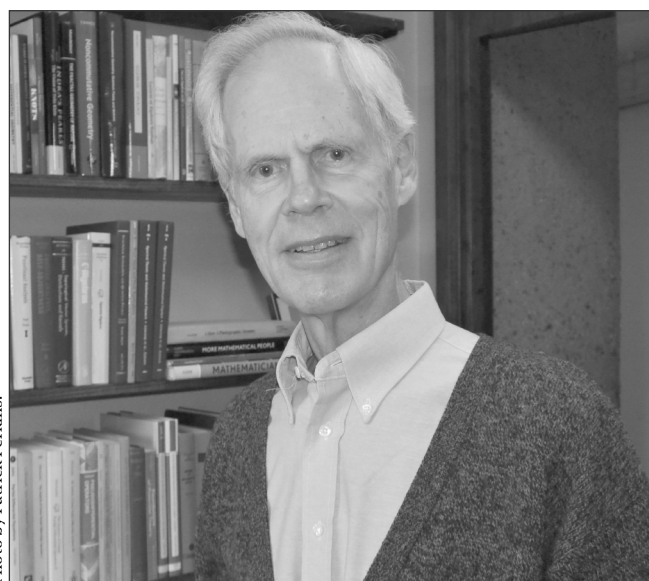


Photo by Patrick Perkins.

Professor Gerald B. Folland is often to be found lecturing at various institutions in India or hiking in the mountains of Washington or the red rock country of his native Utah.