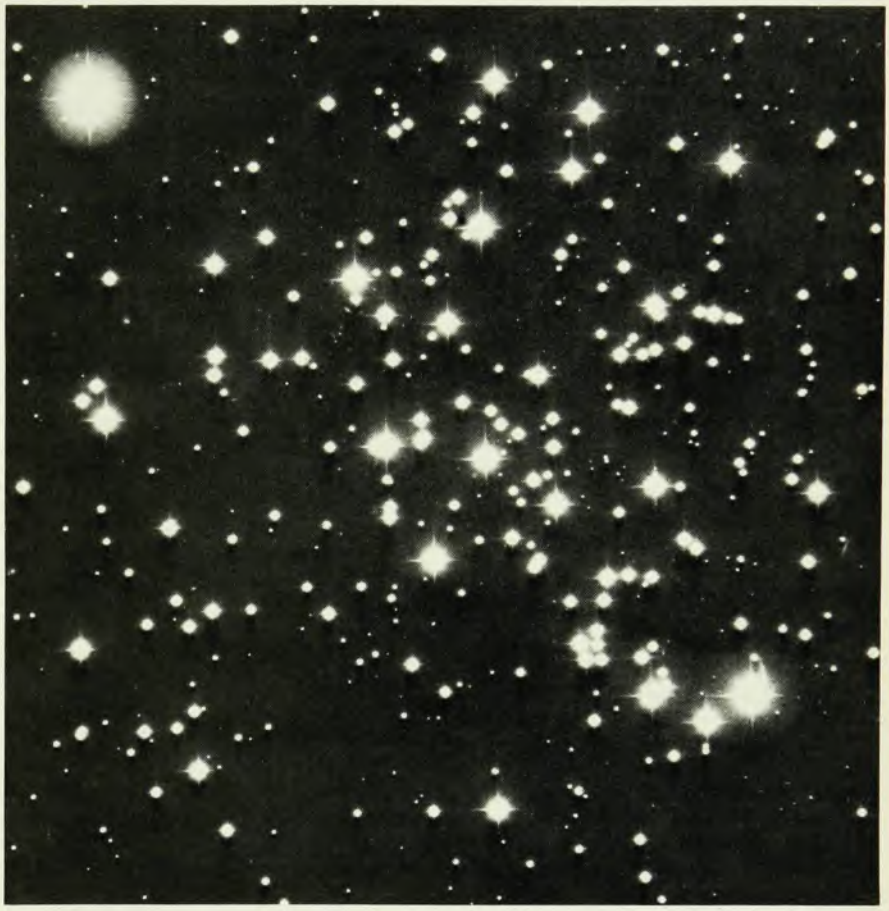
Gonna take a sentimental journey

The Dark Night Sky: A Personal Adventure in Cosmology

D. Clayton
206 pp. Quadrangle, New York, 1975.
$9.95

Reviewed by Edward R. Harrison



The layman sees physicists as enigmatic creatures who hem and haw and utter incomprehensible jargon. Even their spouses and children wonder what makes them tick. Their thoughts flow out of the printing presses of the world as a tiny trickle into the pages of journals unknown to the public, while all the time torrents of astrology pour into the daily media, cataracts of science-fiction hoopla fill bookstores, and whirlpools of mystical mumbo jumbo engulf us. The Arthur Eddingtons and George Gamows are gone, and the only people left to inspire and turn on a new generation of physicists are those who seek their fortunes by writing coy introductory texts. Donald Clayton is not a new Eddington, but at least he tries to do something about explaining physics that is not just infantile or dry as dust.

The Dark Night Sky is a fascinating and well produced book in which Clayton autobiographically unwinds. Here is a simple story, simply told, in which physicists and astronomers are warm human beings and not the weird Frankenstein–Strangelove cranks of the entertainment world. Aspiring young scientists are not misled—as in *The Double Helix*—into the belief that science is an ignoble game of Swedish bingo. Clayton chats about this and that in the universe and his experiences here and there in various places, and he provides several hours of entertaining reading. The main theme is a presentation of cosmology as a personal adventure.

The opening pages are an account of his awakened amazement at the grandeur of the universe while spellbound by the night sky of Texas. Clayton then visits Stonehenge and discusses its significance; this is followed by a pilgrimage to the Swiss village of Cheseaux, where he pays homage to the eighteenth-century astronomer Loys de Cheseaux. He then talks about his experiences at Cambridge in England and weaves into the discourse the work of Rutherford and its impact on modern cosmology. Later on, he takes us fell-walking with Fred Hoyle in the Scottish highlands, and Hoyle's ruminations on steady-state cosmology and pungent remarks on "those chaps" that disbelieve are faithfully reported.

Clayton's experiences at Stonehenge, where he parked his car in a coach-filled car park and marched through a concrete tunnel accompanied by hordes of tourists, recall the time when as a boy I first saw Stonehenge, glorious in its isolation. It is surprising that no mention is made of the giant Avebury ring, more off the beaten track and a superb place for family picnics, or of other great stones of a bygone age (as in the menhir avenues of Carnac) that litter Europe.

To a critical reviewer the puzzling omissions are sometimes vexing. The discovery of the dark night sky paradox is attributed to Cheseaux, who receives excessive adulation, and no mention is made of Edmund Halley's earlier work. The story could have been made more entertaining with a brief outline of the origin in the sixteenth century of the idea of an infinite universe. The idea was conceived in London by the astronomer Thomas Digges, while Giordano Bruno was resident there, and a visit to London is all that was needed to make this momentous discovery into a personal adventure.

The cover truthfully states: "This book is unlike any other . . . ." Hoyle in his foreword perceptively remarks, "I have always felt the lucky people in life are those who know with complete certainty exactly what they wish to do . . . . Don Clayton seeks to tell you why this should be so." The story abounds with an exuberance that sometimes overwhelms, and it reveals a degree of selfconfidence and sense of mission that excite my envious admiration.

The Dark Night Sky crystallizes all the innocence of science. There is no admission of a mawkish sense of guilt, foisted on physicists by a society that enjoys the cornucopia but has gone sick because of gluttony. The issues of nuclear weaponry, hazards of nuclear power and threats of pollution and overpopulation do not muddy Clayton's clear waters. The message is fresh—even brash—and is written by an active scientist for the layman. We need more books of this kind, which present science from a personal point of view.

To a native of Cumberland, the sky above Grassmoor is as wide and bemusing as the sky above Texas. But where each handful of soil contains ancestral ash the air is filled with whispering voices. The difference between the old and new worlds is that Grassmoor is haunted by the past, whereas the Texan silence holds promise for the future.

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Laboratory On-Line Computing

J. E. Brignell, G. M. Rhodes
297 pp. Halsted, New York, 1975. $24.50

On-line computing is a laboratory technique which could be added to the repertoire of many scientists. As mini- and microcomputers decrease in price, they will become common pieces of laboratory equipment. The obvious uses for such computers include experiment control, data processing and recording, decision making, digital processing of analog signals, filtering and noise reduction techniques. In fact, the applications usually are limited only by the operator's imagination and ingenuity.

Essentially, on-line computing involves the use of a computer as a data-processing device with real live data instead of the prerecorded species. Now, before everyone runs out to purchase his own personal computer, I would suggest a reading of John Brignell's and Godfrey Rhodes's new book *Laboratory On-Line Computing*. This is an introductory book written for a limited audience consisting of individuals with advanced degrees and some background in mathematics and electronics. It is these people who possess the capability for the most efficient computer usage; however, anyone contemplating the use of a computer in his lab can benefit from the book. Because the computer field is rapidly evolving, Brignell and Rhodes have kept their presentation general, with the intention that the interested reader will use their bibliography for a more extensive treatment.

The topics covered include computer hardware and software and their interactions, accompanied by a discussion of specific matters such as interrupts and input–output. A mathematical section discusses sampling processes, Z-transform theory and other techniques used in sampled-data theory and digital filtering. The last section deals extensively with so-called "peripherals." In general, a computer with the correct software may be used in the operation and control of expensive scientific instruments by treating the instruments as peripherals. The added sophistication of this method has tremendous potential. For example, a computer-controlled high-voltage source could gradually increase or decrease the potential while making other measurements by outputting a number to a digital-to-analog converter to produce a control voltage. This looks foolproof as long as the software works. However, consider the output of the number negative one: this is all ones or full scale. The point made by the authors is that sophistication works two ways. It can provide an elegant approach to a difficult problem or just add another example to the catalog of "garbage in—garbage out" experiences.

It is difficult to break into this area of research productively. The authors have outlined the basic background necessary for a newcomer to make the transition as painlessly as possible. Let me add one further warning: always remember that with a new sophisticated high-speed digital computer it's possible to make mistakes millions of times faster than with just a pencil and paper.

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Independence and Deterrence—Britain and Atomic Energy, 1945–1952: Vol. 1, Policy Making and Vol. 2, Policy Execution

M. Gowing.
1062 pp. St. Martin's Press, New York, 1974. $25.00 each volume

Margaret Gowing's earlier book entitled *Britain and Atomic Energy 1939–1945* (published in 1964) presents the history of the British nuclear program from its beginning until the successful completion of the American program—to which the British made crucial contributions—in August 1945. That volume describes in detail the origins and early results of the effort, its transfer to North America, and The British hopes, plans and proposals for continuation of the very close wartime cooperation in the post-war era. The two volumes under review are, in effect, despite their somewhat confusing titles, the second and third volumes in Gowing's series on the history of the British nuclear program. They cover the period beginning with the dramatic technical success of the Manhattan Project and its contribution to ending the war in the Pacific in 1945 and ending with the test of the first British-made A-bomb in Australia in 1952.

These two volumes, plus the earlier book, by their very nature will constitute an essential element in the library of any person or institution concerned with either the history of nuclear energy or the history of the modern technological arms race in particular, or with the history of the cold war in general. Happily the volumes are also well written and easy to understand and use. They, like their predecessor are official history based on what the author describes as free access to still classified documents and the subsequent circulation of early drafts among the principals in the story.

Following the discovery of fission in Germany on the eve of World War II, scientists in many countries carried out experiments and calculations intended to elucidate this most interesting new nuclear process. In at least six countries—France, Germany, Japan, the Soviet Union, the United Kingdom, and the United States—scientists with the active interest and support of their governments undertook work designed to explore and exploit two practical applications of the new process, namely the production of useful energy and the creation of an unprecedentedly powerful new weapon, the atomic bomb. For various reasons, the work on the bomb in England soon outpaced that in the other five countries. In the fall of 1941, American knowledge of this British work was, as much as any factor, the immediate stimulus behind the decision to set in motion the US A-bomb program and to establish the Manhattan Project to carry it out. The exigencies of the war made necessary, and the generally very close scientific and political relations made possible, the eventual melding of the British and American programs and the transfer of most of the scientists in the British program (including by then many refugees from the continent) to various laboratories in North America.

Volume 1, as its title indicates, deals with policy making during 1945–52. It relates the essentially sad story of repeated attempts on the part of the British first to continue and then later to