

BOOK AND FILM REVIEWS: The Definitive Treatment: Scientific Study of Unidentified Flying Objects

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The definitive treatment

Scientific Study of Unidentified Flying Objects, conducted by the University of Colorado under contract to the United States Air Force. Edward U. Condon, Scientific Director. Daniel S. Gillmor, Ed. Paperback: Bantam Books, New York, 1969. 965 pp, \$1.95. Hardcover, E. P. Dutton & Co. \$12.95.

Reviewed by Melba Phillips
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Flying Saucers, or UFOs (pronounced OOFOs), have produced the largest upsurge of pseudoscience in recent years. In sensational articles, books, and lectures, it has been contended that some of these objects represent extra-terrestrial civilizations, at home on other planets in our own system or as far away as the Andromeda Nebula,—two million light years. Some proponents of this thesis are highly individual, such as one visitor Dr. Condon has reported, “a well mannered man who claimed to be acting as agent for the Third Universe (we are the First, and the Second is inhabited by beings that resemble polar bears, he said). He said he was authorized to negotiate a contract with the U. S. government by which they would teach us to make interstellar flying saucers for \$3 billion. The first billion was to be paid after a demonstration to government officials at Dulles airport, the second after a

major national laboratory had been built and our scientists and technologists had learned how to make flying saucers, and the third after they had trained our flight crews in interstellar navigation.” In the interim he wanted only \$3 000, as “earnest money.”

Most UFO buffs are of course much more plausible. The extra-terrestrial thesis was put forward by Donald E. Keyhoe, a retired Marine Corps officer, who says, “In 1949, after months of investigation, I wrote an article for *True* magazine, stating that the saucers were interplanetary machines.” The title of this article, and of Keyhoe’s first book on the subject, is *Flying Saucers Are Real*. It is convenient to distinguish flying saucers, a term that connotes extra-terrestrial vehicles if not visitors, as a special category of UFOs, although the distinction is sometimes difficult to maintain. In 1956 Keyhoe founded the National Investigations Committee for Aerial Phenomena (NICAP, *not* a government committee), an organization whose expressed purpose is to study UFO cases on an amateur basis. NICAP claims a membership of 12 000—approximately the same as that of AAPT. (But then it is said that there are 10 000 professional astrologers in America, as against about 2 000 professional astronomers, and the UFO buffs are only amateurs!)

In the Condon Report we find a readable summary of the reasons

why the extra-terrestrial hypothesis is not acceptable in the context of UFOs: Its proponents set aside all the laws of physics, and pay no heed to the inhospitable conditions on other solar planets, the vastness of interstellar distances, problems of entry into our atmosphere, or the enormous reported speeds through the atmosphere with never a sonic boom. All this quite apart from the fanciful stories of “little green men,” which are not considered in the Colorado study. This is not to say there is no intelligent life elsewhere—astronomers and biologists assure us that it is essentially certain—but that communication between planets of different stars is virtually impossible. The recent tentative and already discarded idea that pulsars represented an artifact was not frivolous; on the other hand, there is to this date *no* convincing evidence for “extra-terrestrial actuality” of any UFOs. We are promised that “if new evidence appears later, this report can be appropriately revised in a second printing.”

But the report as it is offers something for every taste. It is a cliché to say the cases read like detective stories, except, like crime cases in real life, they do not always have simple cut-and-dried solutions. A few have had to be left as unsolved, but they do not seem as interesting as some of the others. There is some outright fraud, but more lessons are to be learned from

the unwitting lack of reliability on the part of honest witnesses: The same event can be reported so variously as to be unrecognizable. Two categories of photographs, stock in trade of the sensational magazine articles, were examined as candidates for detailed expert analysis. The first category comprised thirty-five cases reported in the duration of the Colorado study, 1966-68; the second included eighteen perplexing older cases with "high strangeness." Professor William K. Hartmann considers his findings representative of UFO photographs—roughly one quarter are fabrications, one quarter are misidentifications, a quarter have such low information content as to be unfit for analysis, another quarter are clearly recorded but lack sufficient data for analysis. The residual cases that are genuinely puzzling constitute at most a very small percentage.

In addition to reportage and analysis of specific cases, there is much science, of course, for the whole gamut of readers from novice to expert. This is a good place to begin to learn about radar, although the analysis becomes inevitably mathematical in the end. Even in bird radar cross section data! One of the most interesting chapters is that on Atmospheric Electricity and Plasma Interpretations of UFOs. That rare and fascinating phenomenon, ball lightning, is described, as well as the awesome marvels of tornado lightning and mountain top electricity. Here also one may learn in detail the difference between bolides, which may deposit solid meteorites, and the meteors of scheduled meteor showers, which never do. And even if one skips all chapters with numerical data such as the dependence of atmospheric refractive index on pressure, temperature, etc., there is a splendid account of UFOs in history. The modern phase begins in 1947, but the "ufologists" have ferreted out hundreds of earlier reports, beginning with Biblical times. These compilations are sampled, and some investigations of source materials analyzed in a chapter that cannot fail to fascinate

the scientist and humanist alike.

Among the UFO sightings reported there are, as we have noted, a few which have not been accounted for, and in view of the meager and sometimes conflicting data, may never be unambiguously explained. Some of these no doubt represent rare phenomena of nature which would not yet be fully understood even if the scientific data were complete. The Condon Report is clear on this point, but concludes that "further extensive study of UFOs probably cannot be justified in the expectation that science will be advanced thereby." This conclusion is admittedly controversial; it has been misunderstood, misinterpreted, and bitterly denounced. Let us remember that UFO studies consist primarily of interviewing people who report they have seen something peculiar. This is ordinarily all that is possible, since the phenomena are not only rare but of very short duration. The workers on the Colorado project have seen no way out of the resulting difficulties, but they do not rule out the possibility of doing so. On page two we find: "Although we conclude after nearly two years of intensive study, that we do not see any fruitful lines of advance from the study of UFO reports, we believe that any scientist with adequate training and credentials who does come up with a clearly defined, specific proposal for study should be supported." The most urgent recommendation for further research related to UFOs is in the field of atmospheric optics, including radio wave propagation, and of atmospheric electricity, areas in which our present knowledge is quite incomplete.

A special warning is directed toward the use of sensational UFO books and magazines in the schools. Typically this "pulp literature" describes UFOs but never gives explanations, even when the UFOs are not actually fraudulent. It is pointed out that such study is harmful not merely because the material itself is in error, but also because its uncritical use retards the development of a critical faculty with regard to scientific evi-

dence. The Condon Report should be on hand as an antidote to the more available irresponsible UFO accounts, but teachers will also find many parts of it appropriate for study in the schools in a more positive way.

The Graphic Work of M. C. Escher.
M. C. Escher. Meredith Press, New York, 1967. 72 pp. \$7.95.

Reviewed by Lester G. Paldy
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at Stony Brook

This fine book is a most welcome replacement for the first edition which has been out of print in the United States for several years now. The work of M. C. Escher can be found in the homes of scientists and art lovers the world over, but those of us who have not been fortunate enough to obtain a print or lithograph can once again have the pleasure of leisurely examining the works of a master of the graphic arts.

Escher's works can hardly be characterized using language, for they involve notions of geometric symmetry, the concept of infinity, interplay between two and three dimensional objects, and topology. Teachers will find that students who are interested in physics and mathematics will enjoy the seventy reproductions the book contains. Students with a flair for drawing will also be engrossed by the mastery of line and form exhibited in the artists work, and physics teachers who have interdisciplinary interests can consider cooperating with art teachers in developing some theme suggested by Escher.

I can see how any school could use several copies of this book. A teacher might well consider buying two copies; one for his library, and one which could be cut up to serve as a source of prints for framing.

Art books are notoriously expensive, so it is refreshing to come across a book which is modestly priced in view of its content and quality. The printer has done a good job reproducing both black