with 91 percent of the women in the sample and less than ½ percent of those interviewed were unwilling to answer questions about contraception.

Summary that does not risk overgeneralization is difficult, for the questionnaire was elaborate and the classifications were intricate. There are analyses of sterility and fecundity, the use of contraceptives, and attitudes toward family limitation, methods of limitation, and expected family size; each of these categories is analyzed in relation to the others and to the actual and the desired numbers of children. In addition, all variables are related to such factors as religion, education, income, occupational status, the work of wives, and community background, and again they are considered separately and in relation to each other. Throughout the findings are striking, and they are consistent.

The ghost of biological interpretations of declining fertility is banished by the results of this study. There were no evidences of consistent differences in fecundity (the ability to bear children) between women of the various social and economic strata. The influence of impairments on fertility (actual childbearing) was limited by the fact that couples desired only a few children anyway. However, there are surprising findings in this report. Nine percent of all the women interviewed had been sterilized, many of them for contraceptive purposes. One in four of the wives who had ever been pregnant had had at least one fetal death. And approximately 13 percent of all completed pregnancies had been terminated with a fetal death rather than a live birth.

The fundamental finding of this study of a group of white, married women who constituted a probability sample of the national population was that most couples had a fairly specific idea of how many children they wanted, used contraceptives to space their children and to prevent conception when they had the desired number, and were reasonably successful in limiting the number of children if not always in precise spacing of the children. There were differences among subgroups in the dynamics of family formation, in attitudes toward and use of contraceptives, and in size of the completed family. Religion and educational level were more closely related to fertility variables than were income, occupational status, or community background, but a majority of the couples in all groups used some control method, and the predominant family in all groups was small. There was nationwide convergence toward the two-, three-, or four-child family as the ideal, the expected, and the fact.

Forecasts of future births utilized the past experience of cohorts of women, the marriage rates and the birth rates of ever-married women in the various cohorts, and the expectations expressed by wives in the study about the size of their completed family. In specific terms:

"The medium fertility projections for ever-married women assume a rise in family size to about 3 births per woman, with a timing pattern similar to that being developed by cohorts of the 1930s. The low series is based on a return to the small families (averaging about 2.5 births) of the cohorts of 1906-15 and a partial return to their older ages at marriage and childbearing. The high series allows for births per ever-married woman to rise to 3.3 (the maximum expectation of the wives interviewed) and for some continuation of the recent tendency to marry and have babies at younger ages" (page 372).

The three series of estimates of births were utilized in combination with conservative assumptions of future declines in mortality and continued net immigration in preparing three series of projections about future populations. The population used as a base was 171 million for the year 1955. The populations as of 1980 were 215 million for the low projection, 239 million for the medium projection, and 262 million for the high projection. The medium projection is the most interesting model, for it assumes a continuation of the marriage and birth-timing patterns of the women born in the 1930's with a completed family size of three births per ever-married woman. This is a small family pattern, and it yields an annual rate of population growth of only 1.3 percent a year in the last quarter of the century. Yet the continuation of the three-child family under the assumed conditions of early marriage and early childbearing within marriage would produce a population of 312 million by the year 2000 and a population of 600 million by the year 2500.

Let me add quickly that the authors stress again and again the implications of their study for continuing and wider research. The swift development of the two- to four-child family as a nationwide ideal and the almost nationwide achievement of a correspondence between the number of children desired and the actual number of children is incontrovertible evidence that values and behavior in family formation are not static. Repetitive surveys are needed to determine the patterns of correspondence between stated expectations and performance and to ascertain shifts in expectations as they occur. There is the further vast field of research on those factors that are associated with shifts in expectations as they relate to completed fertility, and with the timing of the actual births that lead to a rough equivalence of expectations and completed family size at given levels of expectations.

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Ten Steps into Space. Monograph No. 6, *Journal of the Franklin Institute.* Franklin Institute, Philadelphia, Pa., 1958. x + 202 pp. Illus. $4.

The ten *steps* of this small paperback book consist of ten lectures (by as many experts) given in a series at the Franklin Institute in the spring of 1958. Although intended for engineers and scientists, most of the material is not highly technical, and much of it is definitely on the popular level. The success of the lecture series led to the decision to attempt to reach a wider audience by publication in book form.

In the first lecture, Ley describes the story of space travel from the earliest speculations to the successes of today, and discusses vividly and simply many of the books, both scientific and science-fiction, that have appeared on the subject. Stehling's lecture, concerned with the fundamental components of rockets and their operation, is carefully developed in nontechnical terms. Richey compares solid, liquid, and nuclear fuels and discusses their characteristics in rather complete technical detail. Singer covers the various kinds of information, such as radiation and magnetic fields, that can be obtained from satellite flights, as well as the experimental techniques involved. Herget succeeds in describing celestial mechanics in a way that involves practically no mathemat-

ics, but he covers the work of Kepler and Newton and the principles of modern, man-made satellite flight. An interesting and detailed description of one particular satellite flight, that of Explorer I, is the subject of Heller's lecture. The most technical account in the book is Ehrcke's detailed mathematical analysis of satellite motion; King's discussion of the known data concerning the atmospheres of Venus and Mars is also technical. Simon gives an interesting description of biological physics, and includes a fascinating description of his own balloon flight to an altitude of approximately 90,000 feet. The series concludes with Levitt's stimulating discussion of the future space possibilities of fission, fusion, and solar energy (solar-sailing and photon-rockets are included); the strange relativistic effects that will occur at speeds approaching the speed of light are also considered.

The eminent scientists who delivered these lectures seem to have made a serious effort to get information across to the nonexpert. In almost all cases, they have succeeded well in accomplishing this challenging task. The level of most of the articles is about right for most of the readers of *Science*, and the book should merit their attention.

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A Treasury of Science. Harlow Shapley, Samuel Rapport, and Helen Wright, Eds. Harper, New York, ed. 4, 1958. xiii + 776 pp. Illus. $6.95.

Anthologies are difficult books to review because the reviewer must exercise a considerable amount of personal and subjective judgment. Either he likes the selections the compilers have included in their book or he doesn't. If the latter, he can always compile his own.

Some years ago I indicated that I liked the *Treasury of Science* [*Science* **104**, 430 (1946)]. Two editions later, I still find the book rewarding reading.

Arranged by large topics with numerous subdivisions, the book treats of science and the scientist, the physical world, the world of man, and the rocket and the atom. It is, of course, not possible to list all of the authors included in this scientific smorgasbord. Suffice it to suggest, therefore, that the interested reader will find tidbits from the writings of Sir J. Arthur Thomson, Patrick Geddes, Albert Einstein, Alan Gregg, and Ivan Pavlov. He will also find selections from Copernicus, Galileo, Newton, Bacon, Darwin, and Huxley.

Although most of the material appeared in the earlier editions, several new sections bring the book closer to today's newspaper headlines. Thus, there is a report on radio astronomy by A. C. B. Lovell, George Wald writes on the origin of life, and Warren Weaver reviews some of the thinking on the genetic dangers of fallout.

In summary, with this new edition *The Treasury* has attained the status of a classic and deserves to be read as well as quoted.

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Air Pollution Control. W. L. Faith. Wiley, New York; Chapman and Hall, London, 1959. vii + 259 pp. Illus. $8.50.

This book is intended for those with technical training who are not specialists in the field of air pollution, as well as for intelligent laymen. It is not intended for those seeking a comprehensive treatise on air pollution, for it does not go into any particular phase of air pollution from a fundamental standpoint.

The introductory chapter describes the most important problems of air pollution somewhat superficially. It is surprising that, in the discussion of property damage, there is no mention of the damage to masonry and statuary which occurs in England.

The chapter on meteorology covers general factors that influence the stability of polluted atmospheres. A discussion of smoke problems is followed by a chapter dealing with other particulate materials such as dusts, fumes, and mists. Typical data showing the sources of dustfall and the concentrations encountered in various areas where air pollution exists are given. This material includes a section on sampling and the appraisal of stacks for dusts and fumes as well as brief descriptions of some instruments. In my opinion, sampling procedures should have been treated separately for all cases. Sampling and its concepts assume certain knowledge which is not readily available to the so-called intelligent layman.

The problem of controlling aerosol emissions is discussed in the section on dust, with a brief résumé of the various devices used, after the discussion of sampling. Again, the treatment is descriptive rather than fundamental.

The discussion of gases is similar to the discussion of the particulate problem, with particular emphasis on sulfur, dioxide, hydrogen sulfide, and hydrogen fluoride. Again, sampling methods and control are covered by descriptive materials. Odor problems are discussed in a separate chapter.

Because of the author's personal interest in automobile exhaust, and because of the fact that the Los Angeles area has a serious problem in this respect, the discussion of automobile exhaust and its problems is rather complete. The treatment will be useful to those interested in assessing the present status of the Los Angeles problem.

Separate chapters on air pollution surveys and the legal aspects of air pollution complete the book.

An overall appraisal indicates that the author achieved at least one of his objectives. The book presents some concepts of air pollution to individuals with a technical background. I doubt that it will appeal to the intelligent laymen, as Faith presumed it would.

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New Books

The ABC of Relativity. Revised edition edited by Felix Pirani. Allen & Unwin, London; Essential Books, Fair Lawn, N.J., 1959. 139 pp. $3.75.

Basic Data on Plasma Physics. Sanborn C. Brown. Technology Press and Wiley, New York; Chapman & Hall, London, 1959. 344 pp. $6.50.

Directory of Nuclear Reactors. vol. 1, *Power Reactors.* International Atomic Energy Agency, Vienna, Austria, 1959 (order from International Publications, 801 Third Ave., New York). 214 pp. Paper, $3.50.

The Exploration of Space. Arthur C. Clarke. Harper, New York, rev. ed., 1959. 214 pp. $4.50.

Exploring the Structure of Matter. Jean-Jacques Trillat. Translated by F. W. Kent. Interscience, New York, 1959. 214 pp. $4.85.

A Field Guide to Bird Songs of Eastern and Central North America. Houghton Mifflin, Boston, Mass., 1959. 2 records, $10. The records contain the songs and calls of more than 300 species of land and water birds.