panies in the chemical and chemical process industries, and the librarians of colleges and universities offering degrees or even courses in industrial chemistry and/or chemical engineering.

The paper, printing, and binding are satisfactory for books that will be referred to with considerable frequency.

WALTER J. MURPHY
American Chemical Society

The ISCC–NBS Method of Designating Colors and a Dictionary of Color Names. NBS Circular 553. National Bureau of Standards, Washington, 1955. v + 158 pp. $2. (Order from Supt. of Documents, Washington, 25.)

To both the Inter-Society Color Council and the National Bureau of Standards we are indebted for the development and publication of the *ISCC-NBS Method of Designating Colors*. It is an outcome of problem 2 brought to the Inter-Society Color Council in 1932 by its first chairman, the late E. N. Gathercoal, who represented in the council the *U.S. Pharmacopoeia*. Indeed, it was the problem of naming colors in the *U.S. Pharmacopoeia* and the *National Formulary* of the American Pharmaceutical Association that led Gathercoal, as a part of the 1930 decennial meeting of the USP Revision Committee, to prepare a 90-page printed report on the subject of color names and call for a special color exhibit and a meeting of color experts to decide whether something might be done to find "a means of designating colors in the *United States Pharmacopoeia*, in the *National Formulary*, and in the general pharmaceutical literature. . . . such designation to be sufficiently standardized as to be acceptable and usable by science, sufficiently broad to be appreciated and used by science, art, and industry, and sufficiently commonplace to be understood, at least in a general way, by the whole public."

One result of this exhibit and meeting was to lead to the formation of the Inter-Society Color Council, and the problem of color names, common to all its member bodies, was referred to a Committee on Measurement and Specification, under the chairmanship of the late I. H. Godlove. The 1933 report of this committee outlined a recommended system of color designations that was approved by the council and has been followed by subsequent committees, including the authors of the present report, in developing the system of color designations and in settling the color boundaries. In 1939 the ISCC formally approved and recommended to the N. F. Revision Committee and to the U.S.P. Convention, the method described in NBS research paper RP 1239, written by Deane B. Judd, physicist at the National Bureau of Standards, then chairman of the Committee on Color Problems of the ISCC, and Kenneth L. Kelly, then research associate at the National Bureau of Standards, representing the American Pharmaceutical Association.

Following this 1939 publication, a number of suggestions for revisions were received, particularly from textile groups in the Inter-Society Color Council, and a revision committee was formed in 1947 to study these suggestions and to make recommendations on the name and boundary changes that would make the method more generally applicable in all fields. (Incidentally, it may be of interest to mention that 30,000 copies of the RP 1239 report were sold. This is quite a record for a technical report and shows how real the interest is in this subject.) The changes embodied in the present publication were approved in 1949 by voting delegates of all 19 groups that were at that time member bodies of the ISCC.

The method adopted is simple in principle. The terms *light, medium,* and *dark* designate decreasing degrees of lightness, and the adverb *very* extends the lightness scale to "very light" and "very dark." The adjectives *grayish, moderate, strong,* and *vivid* designate increasing degrees of saturation. These and a series of hue names, used both as nouns and in adjective forms, are combined to form names for describing color in terms of its three perceptual attributes: hue, lightness, and saturation. Certain adjectives cover combinations of lightness and saturation, as *brilliant* for "light, strong," *pale* for "light, grayish," and *deep* for "dark, strong."

The relationship of the names can be explained most easily by reference to what is known as a color solid in which the three dimensions are hue, lightness and saturation; *hue* extends in a circular direction about the neutral axis, clockwise from red through the hues in spectrum order back to red; *lightness* extends in the vertical direction from black at the bottom through a series of grays to white at the top; and *saturation* extends in a radial direction horizontally from the central neutral axis at which the saturation is zero out to their strongest saturation, as far as they may extend from the central axis. There are 267 ISCC-NBS name blocks in the complete system, and each defines a block in the color solid. This number is sufficient for naming colors from memory, but since it is estimated that man can distinguish more than 10 million surface colors, it means that each name block contains a number of distinguishable colors.

The important thing about this method that distinguishes it from all others is that the boundaries of each name designation are fixed. In fact, it is a revision of some of the 1939 boundaries that made this present report necessary. The limits are defined in terms of the Munsell color notation, so that each color designation, consisting of a hue name and modifiers, defines a block in the color solid bounded by vertical planes of constant hue, horizontal planes of constant value, and cylindrical surfaces of constant chroma. Table 1 (p. 4) contains all the hue names and abbreviations used in the ISCC-NBS system, and Fig. 2 (p. 3) shows the scheme of hue modifiers, the "-ish" grays and the neutrals with their modifiers.

The method makes it possible to describe any color in a way that can be understood. It does not provide for pinpointing colors, either in fashion or colorimetry or for any other purpose; but for fashion color names it does provide an understandable descriptive term; and for colorimetry, when it is important to make close distinctions among the thousands of colors that in this system might bear identical designations, resort must be had to one of the several numerical specifications available today that are well standardized—for example, the internationally recognized CIE colorimetric coordinate system or the Munsell notation as smoothed and recommended by the Optical Society of America's 1943 report of the Subcommittee on Spacing of the Munsell Colors.

The report is a book consisting of 13 pages of text, 15 pages of color name charts (each for a given range of Munsell hue) to be used when one wishes to find the name of a color, and 4 pages showing the same color name boundaries in terms of constant Munsell value (used as the measure of lightness). In the sections that follow (pages 37–82) there is a listing of many thousands of synonymous and near-synonymous color names (together with the color name source) grouped under the 267 designations of the ISCC-NBS method. As the report says, the names Testaceous, Samurai, and Araby all refer to grayish reddish orange colors. In a similar way the meaning of all color names in the many vocabularies included (Ridgway, Maerz and Paul, Plochere, Textile Color Card Association names, and nine others) are defined so that, without reference to an actual color sample, one may have an understandable description of what color the name refers to. Under group 87, moderate yellow, for instance, we find such names as *amber, brass, corn, rattan, yellow smoke, chamois, buff, gold, wheat,* all of which are generally understandable, but we find also in the same group such names as *fustic, giallolino, latoun,*

English pink, bubalinus, luteolus, electrinus, most of which would not be understood by the average reader, yet they are all "moderate yellows" in the same sense as the first group of words.

The final section (pages 85–158, three colums to a page) is what the authors call the heart of the color names dictionary. It consists of an alphabetical listing of all of the color names studied, each followed by its equivalent ISCC-NBS designations and a key letter denoting its field of application. Synonymous names are indented under the main color names, and the whole is cross-indexed in detail.

In their summary the authors dedicate the method to everyone who has found it difficult to make his color descriptions intelligible, in the hope that it will eventually find such wide use that it will serve as a common denominator in the varied color terminology used in science, art, and industry. To this hope I breathe a fervent amen.

DOROTHY NICKERSON
U.S. Department of Agriculture

Actions Chimiques et Biologiques des Radiations. M. Haissinsky, Ed. Masson, Paris, 1955. 52 pp. F. 2800.

This is the first of an anticipated series to be published on the effects of radiations on matter, both living and nonliving. The volume is divided into three sections: "Aspects physiques de la radiobiologie," by L. H. Gray; "Chemie de radiations des solutions aqueuses. Aspects actuels des resultats expérimentaux," by M. Lefort; and "Modern trends in radiation biochemistry," by W. M. Dale.

L. H. Gray presents in a very readable fashion the fundamental concepts of radiation interaction with matter, from soft x-rays to supervoltage x-rays and gamma rays as well as neutrons and heavy charged particles. Methods and reliability of dosimetry are discussed. For many of the subjects discussed, biological data related to the subject are given. Lefort presents a well-organized account of present knowledge of the radiation chemistry of aqueous solutions. The last chapter on oxidation of organic compounds should be interesting to the radiobiologist. Dale, in his concluding chapter, shows the application of the fundamental principles discussed by Gray and Lefort in modern radiobiology. The indirect action of radiation is discussed progressing from the molecular level through living cells to the whole animal.

This volume is exceedingly well organized, with enough overlapping to make the transition very smooth from chapter to chapter. This volume, along with the other anticipated volumes, should be a real aid to the teacher as well as research worker in this field. The editor and authors should be congratulated on the publication of this collection.

GEORGE E. STAPLETON
Biology Division,
Oak Ridge National Laboratory

Radiocarbon Dating. Willard F. Libby. University of Chicago Press, Chicago, ed. 2, 1955. ix + 175 pp. Illus. $4.50.

The first edition of this important book by the developer of the carbon-14 method of dating was published in 1952. The second, revised edition describes subsequent improvements in the measurement technique and also includes a detailed list of the dates obtained in the author's laboratory prior to the fall of 1954.

These dates, which occupy more than one-third of the text, number 356. Thirty-four relate to Egypt, the Near East, and Western Asia, 34 to Western Europe, 217 to the United States, Canada, and Alaska, 22 to Mexico and Central America, 20 to South America, 27 to various other areas (Manchuria, Japan, Hawaii, Oceania, and Africa), and 2 to tree-ring samples. Many of the dates will be of interest only to professional archeologists; but some are undoubtedly of more general interest. Thus, the famous Florisbad skull from Orange Free State, South Africa, is dated as older than 41,000 years; the Folsom culture at Lubbock, Texas, at 9883 ± 350 years; the first phase of Stonehenge at 3798 ± 275 years; the Dead Sea scrolls at 1917 ± 200 years; and the prehistoric city of Zimbabwe, in South Rhodesia, is given a date of A.D. 574 ± 107 on the Christian calendar.

A chapter on the significance of radiocarbon dates by Frederick Johnson, an archeologist, has been revised and expanded. Johnson observes that where various sorts of evidence, archeological and/or geological, lead to real conclusions concerning chronology, the radiocarbon dates are in general agreement; the major difficulties involve situations where archeologists or geologists do not agree among themselves. He thinks that the results of the carbon-14 dating method are, in general, sound, and that—barring mistakes by collectors and laboratory workers—most of the errors can be traced to the process of selection and collection of samples.

Libby's book will undoubtedly appeal to a varied audience. But it is a "must" for those, such as archeologists and anthropologists, who are particularly concerned with the dating of prehistoric remains and artifacts.

WILLIAM L. STRAUS, JR.
The Johns Hopkins University

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, *but to the publisher or agency sponsoring the publication.)*

Society of Biological Chemists, India, Silver Jubilee Souvenir, 1955. The Society, Bangalore, India, 1955. 262 pp. $3.

The Institute of International Education, 1955 Annual Report. The Institute, New York, 1956. 48 pp.

Prenatal and Paranatal Factors in the Development of Childhood Behavior Disorders. Martha E. Rogers, Abraham M. Lilienfeld, Benjamin Pasamanick. Johns Hopkins University Press, Baltimore, Md., 1955. 157 pp.

Preliminary Report on Financial Protection against Atomic Hazards. Arthur W. Murphy *et al.* Atomic Industrial Forum, Inc., New York, 1956. 37 pp.

Sand Variation at Point Reyes Beach, California. Tech. Memo. No. 65. 1955. 86 pp. *Factors Affecting the Economic Life of Timber in Coastal Structures.* Tech. Memo. No. 66. 1955. 23 pp. *A Model Study of the Run-Up of Wind-Generated Waves on Levees with Slopes of 1: 3 and 1: 6.* Tech. Memo. No. 67. 1955. 19 pp. *Wave Action and Sand Movement near Anaheim Bay, California.* Tech. Memo. No. 68. 1956. 21 pp. Beach Erosion Board, Office of Chief of Engineers, Washington 25.

The National Formulary 1955, First Amendment 1956. Pharmaceutical Press, London, 1956 (order from Rittenhouse Bookstore, Philadelphia). 6 pp. 6d.

The Effect of Water Impurities on the Flavor of Brewed Coffee. Publ. No. 6. Ernest E. Lockhart, C. L. Tucker, M. C. Merritt. Coffee Brewing Institute, New York, 1956. 11 pp.

Instrumentation and Methods for Radioactivity Detection in the Mineral Industry. Quart. Colorado School of Mines, vol. 51, No. 1. James O. Milmoe and Stephen P. Kanizay. Colorado School of Mines, Golden, 1956. 97 pp. $1.

Studies in Cheremis: the Supernatural. Viking Fund Publ. in Anthropology, No. 22. Thomas A. Sebeok and Frances J. Ingemann. Wenner-Gren Foundation for Anthropological Research, New York, 1956. 357 pp. $5.

Mathematics in an Industrial Economy. Industrial Mathematics Society, Detroit, Mich., 1955. 15 pp.

American Society for Artificial Internal Organs, Transactions. vol. 1. The Society, Los Angeles 29, 1956. 106 pp. $3.

Commercial and International Developments in Atomic Energy. Proceedings of a meeting for members and guests, 27–29 Sept. 1955, Sheraton-Park Hotel, Washington, D.C. Atomic Industrial Forum, New York, 1956. 598 pp. $8.50.