Book Reviews

Aluminum Paint and Powder. Junius D. Edwards and Robert I. Wray. Reinhold, New York, ed. 3, 1955. viii + 219 pp. Illus. $4.50.

The reader of this 219-page book by two men who have been the leaders in the development and increasing use of aluminum paint expects a clear, authoritative, and complete discussion of the subject, and he is not disappointed by this book. Well printed and copiously illustrated, the book gives a picture of the production and properties of aluminum powder and the formulation, properties, and uses of aluminum paint that is more complete than that available anywhere else. Other uses of aluminum powder and other varieties of the powder than those used in paint are also covered.

A discussion of methods of production is followed by a description of methods of testing the powder in the laboratory, the grading system used by Alcoa for the powder, and the uses of the different grades. Important precautions that should be observed in handling and storing the powder are mentioned.

The chapter on the composition of aluminum paint discusses the selection of the pigment grade and the formulation of the vehicle from the standpoint of the intended use of the paint. The kauri reduction test for the toughness of the vehicle is described and its importance is pointed out. Different types of varnish, lacquer, and synthetic resin vehicles are discussed and examples of their composition are given.

A chapter on aluminum paint in the protection of metals describes and illustrates various practical large-scale and laboratory tests of aluminum paint on steel. The importance of pigment concentration, vehicle viscosity, and composition are discussed and illustrated, as well as the preparation, priming, and painting of steel surfaces. The painting of aluminum, magnesium, and zinc, as well as special paint finishes such as the polychrome finishes used on automobiles, is also discussed.

Another chapter discusses the reflectance of aluminum paint, including that for ultraviolet and infrared radiation. The importance of the high visibility of aluminum paint on bridges and its high reflectivity for heat radiation on oil tanks is emphasized. The use of a properly formulated aluminum paint on the steel parts of furnaces to reduce thermal radiation and protect the metal is described and illustrated. The practical value of the opacity or "hiding power" of aluminum paint, its thermal and electric conductivity, and its resistance to penetration by water vapor are discussed. Figures are given for the effect on permeability of exposure to light and atmospheric influences for from 3 to 24 months for a variety of aluminum paints and other paints. Figures are also given that show the effect of such exposure on the tensile strength of the paint film, and the effect of hydrogen sulfide on the standard light-colored paints is discussed at an appropriate point.

The use of aluminum paint as a primer in the protection of wood is important, although it is not noticed as often as its use in the protection of steel. Tests at the Forest Products Laboratory and Aluminum Research Laboratories that show the ability of the aluminum primer to protect wood from the penetration of moisture and consequently to prevent warping and cracking of the wood are described and illustrated. Differences in the effects with different kinds of wood are noted. Proper vehicles for painting on wood are discussed and the advantages of "back painting" of lumber are pointed out.

The last chapter discusses the use of aluminum powder in other arts such as printing, coating of paper, plastics, powder metallurgy, and aeration of concrete. Practical experience and results in these fields are discussed. Pyrotechnic uses of aluminum powder—including its use as an additive to TNT in military explosives—are considered. The use of the powder in caulking compounds and cements, mold washes, the treatment of silicosis, and aeration of soap are also described.

It will be clear to the reader that aluminum powder has made great strides since World War I, when its application with "banana oil" lacquer to the decoration of radiators was about its only commercial use.

FRANCIS C. FRARY
Aluminum Company of America

Machine Translation of Languages. Fourteen essays. William N. Locke and A. Donald Booth, Eds. Massachusetts Institute of Technology, Cambridge, Mass.; Wiley, New York; Chapman and Hall, London, 1955. xii + 243 pp. $6.

Large-scale computers can now perform exceedingly complex operations, mathematical and logical. They can be programmed to process vast amounts of data. Their "memories," in the form of punched cards or magnetic tapes, for example, can be tremendous. If languages consisted only of vocabulary and grammar—with one-to-one correspondences in meaning between the words of one language and those of another, and with the grammars of each formalizable as sets of logical rules—then an automatic dictionary would be a matter of input-output equipment, large enough memory capacity, and means for memory searching (all these exist in computers already), and machine translation would be possible when the automatic dictionary is augmented by a logical computer programmed to transform from one set of rules to another.

The 14 essays and historical introduction of this book trace the developments in and grapple with the problems of this field in its manifold aspects, engineering and linguistic. In a sense, some are concerned with bridging the gap between the problem of translation between natural languages and the afore-mentioned problem, the soluble one of translating between two completely formalized languages. The first essay (Weaver) is historically significant not only as the first presentation, apparently, of the general problem but also because of the leads for further research disclosed therein. The next (Richens and Booth) deals with some actual methods of mechanical translation, and specimens thereof, illustrating how problems such as stripping off endings to get at the root or how the wider problem of getting to the semantic units of the communication can be approached.

The third essay (Oettinger) summarizes a thesis on the design of an automatic Russian-English technical dictionary. An experiment with monolingual volunteers showed with high probability that a scientist armed therewith could not only extract information clearly enough for his own purposes but could also communicate it to others. The next (Harper) goes into the syntax, morphology, and vocabulary of Russian, a specific mechanical translation procedure, and an example of its application. The eighth (Dostert) describes the Georgetown-I.B.M. experiment in which actual machine translation from Russian to English was done. The fifth essay (Bull, Africa, and Teich-

roew) goes in some detail into the problems of the "word," the interplay between dictionary and machine concepts of word, organization and size of machine memory and its connection with relative frequencies and other characteristics of language.

The sixth essay (Locke) deals with the possibility of spoken, rather than written input, the seventh (Booth) with storage (memory) devices, and the ninth (Reifler) with the mechanical determination of meaning. The emphasis is on German, for which somewhat detailed analysis is given. Grounds are shown to exist for hoping that human preediting (to match text to machine capabilities) or postediting (to make the raw output more palatable linguistically) can be eliminated. A simplified English suited to the machine is exhibited next (Dodd). It is readily comprehended and sufficiently close to conventional English that a trained typist could simultaneously translate and type the input with little loss of speed. It may well be less expensive to take this approach initially than to handle the raw natural language with a machine capable of dispensing with preediting. Some practical development problems (Perry) of the general field are then treated; these are followed by a discussion of idioms (Bar-Hillel). The notion that idioms might foredoom mechanical translation to failure was dispelled for this reviewer, for an enlarged dictionary and more complicated searching are most of what idioms entail. Logical concepts for syntax (Wundheiler) and a discussion of syntax and the problem of multiple meaning (Yngve) close the book.

The problem of technical translation alone is so pressing that development of mechanical methods is more than welcome. This book should be valuable not only as an excellent introduction to the field and a stimulus to further research; it may well help generate support for large-scale attack on the problem. It does not seem rash to assert that mechanical translation is not only possible but feasible and that it is fraught with profound implications for the future.

JEROME ROTHSTEIN
Signal Corps Engineering Laboratories

The Technology of Solvents and Plasticizers. Arthur K. Doolittle. Wiley, New York; Chapman and Hall, London, 1954. xv + 1056 pp. Illus. $18.50.

This book covers an astoundingly wide field of phenomena with a remarkable degree of detailed information and fundamental approach to all individual cases. For the scientific research worker, it is very valuable because it contains much factual and numerical data on a large number of important substances; for the chemist in industry, it is of equal importance because it provides him with simple and lucid explanations of such fundamental phenomena as solubility, compatibility, viscosity, and rheology. It is a real bridge between scientific approach and practical attitude; only a man like Doolittle, who is thoroughly and fully familiar with both fields and has contributed substantially to each of them, could successfully tackle this task and come out with a book of this scientific level and of this eminent practical usefulness.

First comes a general survey on solvent and plasticizer utilization and on the technology of resinous materials; there follows an enumeration of individual high polymers, such as cellulose nitrate, vinyl-type polymers, phenolics, urea- and melamine formaldehyde condensates, and other coatings and finishes.

The next chapters are devoted to the description of special adhesives and solvents, their physical properties, physiological action, and commercial handling.

Then three chapters that are more theoretical in character are added: viscosity of liquids, theory of solvent action, and principles of plasticization. A very complete and detailed description of the essential properties of all important plasticizers is given.

The text is presented in an attractive and pedagogic fashion; it contains many instructive tables and well-selected figures, which add a great deal to the educational character of this volume. Everybody who is interested in the field of solvents, resins, and plastics will profit greatly from this book and offer his thanks and appreciation to its author.

H. F. MARK
Polytechnic Institute of Brooklyn

Electroplating Engineering Handbook. A. Kenneth Graham and H. L. Pinkerton, Eds. Reinhold, New York, 1955. xix + 650 pp. $10.

This very complete compilation of engineering data has been assembled by a staff of associate editors and more than 40 experts in various phases of the electroplating industry. The authors of the chapters are identified and are all well-known experts. Each chapter is provided with a short list of references to the technical literature. A 10-page glossary follows the table of contents, and an adequate 24-page index is placed at the end.

The subject matter has been selected to assist a manufacturer to set up and equip a plant that will utilize electroplating procedures, starting with the selection of the plant location and layout, and including the specification of plating equipment, low-voltage d-c generators or rectifiers, materials to line tanks, ventilation systems, and finishing equipment. Part I, "General processing data," provides instruction in the methods of preparing the surface to be plated, compositions of plating baths and methods to analyze them, methods of testing the adhesion and quality of the electrodeposited metal; it discusses industrial hygiene and safety, and finally, reviews current practice in the important problem of waste disposal. Part II, "Engineering fundamentals and practice," is concerned more with plant design and operation, based on the extensive industrial experience of the editors and their collaborators.

This handbook, thus, is thoroughly practical, yet includes enough theory to support the recommendations. For example, in the chapter on "Rinsing," the applicable equations are developed to establish the most efficient rinsing cycles that utilize a minimum quantity of rinse water. A comparison is made of multiple countercurrent rinsing, spray rinsing, and spray and dip rinsing. The chapter even includes a discussion of ion-exchange resins to demineralize the effluent. Each phase of the electroplating industry is treated equally exhaustively.

This handbook will undoubtedly remain the standard reference work on commercial electroplating for a long time and will be used extensively in college courses in industrial chemistry and chemical engineering. In making it available, the editors and publishers have performed a useful service.

LAURENCE S. FOSTER
Belmont, Massachusetts

New Books

Glossary of Selected Geologic Terms. With special reference to their use in engineering. Colorado Scientific Society Proceedings, vol. 16. The Society, Denver, 1955. 165 pp. Paper, $2.75; cloth, $3.50.

My Hobby Is Collecting Rocks and Minerals. David E. Jensen. Hart, New York, 1955. 122 pp. $2.95.

Science and the Course of History. Pascual Jordan. Trans. by Ralph Manheim. Yale Univ. Press, New Haven, Conn.; Oxford Univ. Press, London, 1955. 139 pp. $2.50.

The Contriving Brain and the Skillful Hand in the United States. Something about history and philosophy of history. James C. Malin. The author, Lawrence, Kan., 1955. 436 pp. $3.50.

Problems and Control of Air Pollution. Proceedings of the First International Congress on Air Pollution held in New York City, 1–2 Mar. 1955, under the sponsorship of the Committee on Air-Pollution Controls of the American Society of Mechanical Engineers. Frederick S. Mallette, Ed. Reinhold, New York; Chapman & Hall, London, 1955. 272 pp. $7.50.