mathematical and statistical argument is rather amateurish throughout the book. Many of the modern statistical techniques such as Student's ratio, regression methods, analysis of variance and statistical estimation, used by some medical men, are not even mentioned. The distinguishing feature of the book lies in well-chosen examples and a thorough discussion of them in relation to the statistical methods actually considered in the book. The book should perhaps be useful as an introduction to statistics for those medical and biological students who have only a secondary school mathematical background and who know nothing about statistics.

Applied General Statistics. By FREDERICK E. CROXTON and DUDLEY J. COWDEN. 18+944+13 pp. New York: Prentice-Hall. 1940. $4.00.

THIS is perhaps the most comprehensive text-book on elementary applied statistics that has ever appeared. It falls primarily in the category of "descriptive statistics," that is, it deals mainly with the practical problem of collecting, analyzing and presenting statistical data, touching very lightly and incompletely on probability theory and its application to the problem of drawing inferences from the data. The plan of the authors, followed throughout the book, is to introduce the student to the various known elementary descriptive statistical procedures and illustrate them thoroughly with applications, appealing largely to the intuition and common sense of the reader in justifying the techniques rather than undertaking a systematic logical and mathematical discussion of the assumptions and principles underlying them. The book is written primarily for social science students, particularly those of business and economics, with very little mathematical background. Applications of the techniques are made on many well-chosen examples taken from economics, business, sociology and industry. Some idea of the extent to which the methods have been illustrated can be gained from the fact that there are 180 tables and 257 charts in the book. The fundamental concepts and mathematics involved in these methods have not, in the opinion of the reviewer, received adequate attention from the authors, although derivations of some of the simpler formulas have been given in an appendix. The normal probability function, Fisher's t and z, Snedecor's F and other commonly used statistical tables are included in appendices at the end of the book. A highly detailed index is given.

The authors have been rather complete in their coverage of elementary descriptive statistical methods commonly used in economics, business and sociology. Teachers of introductory statistics courses in these fields who have to handle students with sketchy mathematical background should find this book well suited to their needs. Many of the research investigators in these fields should find the book useful in increasing the objectivity of their own work.

S. S. WILKS

PRINCETON UNIVERSITY

REPORTS

PURE AND APPLIED SCIENCE RESEARCH AT MELLON INSTITUTE, 1940–41

THE thirtieth anniversary of the operation of Mellon Institute's research procedure in collaboration with the University of Pittsburgh was marked by the extension of the range of activities to broad service in national defense. The present emergency has induced much more investigation on problems having important relations to the country's future welfare. Ninety-three industrial fellowships, of which 32 are multiple and 61 individual, have been at work in the institute during its fiscal year, March 1, 1940, to March 1, 1941. These investigations have employed 187 fellows and 114 fellowship assistants. During this fiscal year the institute has spent $1,258,866 in conducting these research programs and its comprehensive studies in pure science, which have been assuming more and more professional and public importance, according to the twenty-eighth annual report of the director, Dr. E. R. Weidlein, to the trustees of the institution.

Chemical, bacteriological and clinical investigations on the chemotherapy of pneumonia have been continued vigorously in the institute's department of research in pure chemistry in cooperation with a staff of medical associates at Mercy Hospital in Pittsburgh. From a chemical point of view the main emphasis, as heretofore, has been in the field of modified cinchona alkaloids. Methods of introducing thiol groups, at desired positions in the cinchona molecule, have been devised, and a study of such sulfur analogs of apocupreine, quinine and alkyl and hydroxyalkyl ethers is in progress. A variety of sulfonic acid derivatives of the alkaloids have been made and tested for action on the pneumococcus. Much work has been done in the cinchonidine series. Monographs are being made ready for release on the chemotherapy of malaria and on structure and antipneumococcic activity in the cinchona series. In a series of cases of pneumonia treated during 1939–40 there was found practically an equal mortality in the treatment with hydroxyethylapocupreine and with sulfapyridine. The results of treatment of 494 pneumonia cases by hydroxyethylapocupreine in the period 1935–40 have shown a marked lowering of

the total mortality and of the mortality in both the bacteremic and the non-bacteremic cases.

Under subsidy of the institute, at The Western Pennsylvania Hospital, researches have been carried forward in other phases of chemotherapy, in natural resistance factors in pneumococcic infection and the common cold, and in basic bacteriological experimentation bearing on chemotherapeutic procedure. Sulfathiazole has been found efficacious in 431 cases of varied infections. Further investigation of natural resistance has had to do with the effect of carbonic anhydrase on changes in warming time reactions and with the use of carbon dioxide inhalations in the treatment of subacute rheumatoid arthritis. The findings so far suggest that carbon dioxide impoverishment may well be a factor in the development and progress of this disease.

Another pure research project of the institute is concerned with the establishment of pharmacopoeial standards for surgical dressings and for gut and silk sutures. Standards for purified absorbent cotton have been revised, and standards are being proposed for absorbent gauze and roller bandages and for adhesive absorbent compresses employed as first-aid dressings. Standard diameters and tensile strength requirements for boilable and non-boilable gut sutures are under revision, and standard gages and strengths for silk sutures are being worked out.

During the year the nutrition fellowship of The Buhl Foundation terminated its five-year program of fundamental research on the relation of foods to dental caries. The conclusion has been reached that preeruptive influences are dominant in the subsequent susceptibility of rat teeth to caries. It has been suggested in fact that caries-resistant teeth can be produced by preeruptive nutrition. Fluorine plays a prominent part in such caries prevention and according to available data exerts its action by modification of enamel structure. It has been proposed that caries can largely be prevented by the preeruptive use of fluorides, but supporting data from human caries are needed before such a practice can be defined for introduction.

Air Hygiene Foundation, a non-profit organization for the conservation of employee health in the industries, whose headquarters are at the institute, is concentrating its efforts on industrial health defense along a wide front, namely: revision of its programs of medical and engineering research to stress projects of more immediate benefit in the national emergency; more attention to chemical hygiene with its multiplying problems arising from the rapid introduction of new industrial solvents and other essential compounds; initiation of a study of sick absenteeism in industry, seeking to help reduce the great losses to labor and management suffered from this cause; and expansion of plant surveys for member companies to combat occupational hazards which augment with increased production. Foundation researches have proceeded at the Harvard School of Public Health on particle size in relation to silicosis, on gases and fumes evolved in arc welding with coated rods, and on hood design for tanks. The foundation also supports investigations at The Saranac Laboratory and the University of Pennsylvania. It continued the issuance of the monthly *Digest of Industrial Hygiene,* published the proceedings of the fifth annual meeting, and started a series of bulletins on "Industrial Health Defense."

The pearl fellowship, which has given a physicochemical basis to margaritology, perfected a radiographic method for showing the structural differences of cultured and natural pearls. The fellowship on laboratory constructional materials evolved an entirely new ceramic body possessing properties required for table-top service. The multiple fellowship on refractories announced new testing procedures for the pyrometric cone equivalent of clays and for the consistency of mortars; it has been studying the action of slag on refractories and has aided in developing methods for measuring brick and shapes for size and warpage. The fellowship on graphite improved methods of manufacturing crucibles. The multiple fellowship on heat insulation is carrying on investigations on the effects of chemical composition and physical characteristics on the rate of heat transmission through various insulating materials and on preventing the penetration of water vapor into insulation used at subzero temperatures.

The multiple fellowship on protected metals demonstrated that the cupriferous cement Hubbellite is permanently self-sanitizing in a practical way and will not give rise to sparks where used in floors. The mineral products fellowship expanded the utilization of Garspar into the sanitary ware and wall-tile fields, showed its value in nodulated glass batches, and found that Garcolite, another special silica product, improves portland cement mixtures. The fellowship on optical glass devised procedures of chemical treatment to increase the transparency of polished glass surfaces and to raise the durability of optical glass. The ceramic chemicals fellowship is adapting the Hommelaya process to the enameling of hollow ware. The multiple fellowship on plastic metals is developing equipment for the production of electrolytic iron powder and melting stock. The acid recovery fellowship made notable advances in treating waste pickle liquor. The fellowship on metal-working contrived an automatic continuous method of pickling and galvanizing cylindrical vessels. The multiple fellowship on sulfur began research on the behavior of olefins with sulfur.

The investigation of the major problem of the gas purification fellowship, the removal of organic sulfur from coke-oven gas, has been advanced to the pilot-plant stage. The work of the gas byproducts fellowship has led to a new series of pigments and to novel inhibitors from ammonium thiocyanate. The tar-distillation fellowship has been engaged in separating paraffins and naphthenes from the otherwise pure aromatics from light oil. The multiple fellowship on tar treatment has effected a new separation of the constituents of anthracene cake and is looking for uses for the recovered carbazole and phenanthrene. The multiple fellowship on tar synthetics is engaged in upgrading byproducts of the coking process by employment of high-pressure catalytic techniques. The multiple fellowship on natural gas began comprehensive research on the fractionation of various liquid hydrocarbon mixtures. The multiple fellowship on petroleum moved forward in the study of micro-analytical methods for examining petroleum products, in research on fractionation in vacuum, and in investigations of desulfurization and of engine deposits. The oil cleaner fellowship has been studying the basic principles involved in the removal of solid sludge by mechanical straining action. The fellowship on watch technology completed its development of new lubricants especially valuable for watches, clocks, meters, and instruments requiring lubricating agents that will remain effectual under conditions where a continued delivery of lubricant can not be readily provided.

The multiple fellowship on organic synthesis, 27 years of age, accomplished advances in researches on hydraulic fluids, gas purification and dehydration, surface-active compounds, synthetic coatings, and textile lubricants. The multiple fellowship on chemical hygiene devoted most time to the investigation of actual industrial hazards, such as skin contact and vapor inhalation, from newly synthesized organic compounds. The iodine fellowship found that powdered potassium iodide could be given stability by a waterproof coating of calcium or magnesium stearate, greatly reducing the loss of iodine from iodized salt and feeds. The multiple fellowship on food varieties announced several novel foods and results on the availability of calcium in strained foods. The multiple fellowship on meat merchandising described 15 new Tenderay plants and also improved commercial practice in this process of tendering edible flesh. The Sterilamp fellowship learned that ultra-violet radiation of the wave-length 2537 Å markedly reduces any initial surface contamination where applied to freshly produced foods, lengthening the storage life of these comestibles.

The multiple fellowship of the Cotton Research Foundation made excellent progress in increasing cotton tire cord strength and flex-life, in using cotton lint, linters, and cottonseed hull fibers in paper making, in preparing cottonseed proteins and activated carbons, and in evaluating the nutritive properties of cottonseed meal and its constituents. The multiple fellowship on garments has discovered that increased wear performance of fabrics can be attained through selected weaving conditions and has evolved processes for fusing fabrics that are in successful industrial employment. The textile finishing fellowship introduced Onyxsan, a new type of cationic finishing agent for rayon fabrics, a mixture of high molecular weight imidazoline salts, now in use on about one third of the total rayon production of the United States. The multiple fellowship on commodity standards is determining the degree of usefulness of various kinds of informative labels as to both their merchandise selling power and their value to the public.

The Gartex fellowship made advances in investigating problems connected with the production of the processed silica known as Gartex and its utility as a filler in the rubber, paint, and resin industries. The Raolin fellowship carried into commercial production its accomplishments along new lines in the field of chlorinated rubber manufacture and applications. The multiple fellowship on protective coatings investigated the effect of variations in relative humidity upon the incipient corrosion of ferrous metals under continuous resin films and also studied the kinetics of resin formation and degradation. The meter fellowship evolved a special laminated phenolic-type water-meter disc for continuous use at boiling temperature and has under development other new types of plastics for employment in water meters at medium and high temperatures and for application in gas-meter diaphragms.

Eight industrial fellowships began their researches during the fiscal year: foundry practice, leather reclamation, lignin, nacre, petrolatum, phenol chemistry, powder metallurgy techniques, and sugar chemistry. Three other new fellowships have been accepted and will start their programs before long. Seven fellowships concluded their investigations during 1940–41.

During the calendar year 1940, a new periodical (*Nutritional Observatory*), 12 bulletins, 25 research reports, and 41 other papers were published. The total contributions to the literature for the thirty years ended December 31, 1940, have been 18 books, 153 bulletins, and 1,800 articles. Forty-six United States patents and 30 foreign patents on fellowship inventions were issued in 1940; 801 United States patents and 841 foreign patents have been granted since 1911.

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