the Virginian Mallet 450 tons, side by side, lightning striking the Empire State Building. . . . There is perhaps a straining after "the world's greatest . . ." sometimes the student will learn no physics from the picture, but he will be interested and he may ask questions; certainly he will gain information.

Professor Kilby's book is a second edition (first, 1929). As the number of pages shows, it is a brief course in fundamentals. It is conservative and practical, orthodox and logical in its arrangement, direct and clear in statement, up-to-date in regard to neutrons, protons, electrons and atomic structure. It will answer the needs of many instructors giving a three-hour first course in physics.

Coming to high-school texts we have the book by the reminiscent combination, Black and Davis. Like the Millikan, Gale and Edwards text it has many figures (492), many photographs (116). As might be expected of these authors, the photographs are of up-to-the-minute affairs, the stratosphere balloon and gondola, radio meteorograph, electric refrigerator, rock-wool insulation, the cyclotron. Sometimes full use is not made of the photographs. Here is one of a tug of war between a 7,200-pound elephant and a tractor. But the weight of the latter was not given, nor the coefficient of friction in either case. Why not the draw-pull of each? (The tractor won.) The text is a study in pedagogy as well as in physics. It is inductive in method, emphasizes physical principles by illustrations from daily life, uses various styles of type to emphasize main points, qualitative questions and arithmetical problems follow each chapter, there are frequent summaries and reviews.

The Clark, Gorton, Sears text is very much like the Black and Davis, only more qualitative. Here again diagrams and photographs are much in evidence. There are 750 of these, together with several photographs of physicists. Some of the photographs of apparatus are out of the ordinary. Here are eight photographs which might be labeled "How to operate an airplane." Here are eight diagrams illustrating airplanes stunting—"A snap roll," "A chandelle," "An Immelman roll." There are several other photographs of airplanes. Obviously all these are for display or for arousing interest.

Again there is interest in the pedagogical aspect. There are previews of units, questions preceding every chapter to arouse the interest of the student, and at the end of each chapter exercises (qualitative questions and problems) and a summary.

The treatment everywhere is exceedingly elementary.

GORDON FERRIE HULL

SOCIETIES AND MEETINGS

THE AMERICAN CHEMICAL SOCIETY

ELECTION of 126 chemists to administrative and editorial posts in the American Chemical Society, which has a membership of more than 22,000, was announced recently. The society's eighteen professional divisions named officers for 1938–39, and editors of five scientific publications were chosen. The divisional officers are:

Division of Organic Chemistry: Chairman, Werner E. Bachmann, of the University of Michigan; *secretary,* Ralph L. Shriner, of the University of Illinois; *executive committee,* in addition to officers and ex-officers, Charles F. H. Allen, of the Eastman Kodak Company, Rochester, N. Y.; Louis F. Fieser, of Harvard University; Lyndon F. Small, of the University of Virginia.

Division of Physical and Inorganic Chemistry: Chairman, George Scatchard, of the Massachusetts Institute of Technology; *chairman-elect,* G. Frederick Smith, of the University of Illinois; *secretary-treasurer,* Harold C. Urey, of Columbia University; *on executive committee,* Harold S. Booth, of Western Reserve University; George S. Parks, of Stanford University.

Division of Industrial and Engineering Chemistry: Chairman, Walter L. Badger, of the Dow Chemical Company, Ann Arbor, Mich.; *vice-chairman,* Barnett F. Dodge, of Yale University; *secretary-treasurer,* Howard S. Gardner, of the University of Rochester; *executive committee,* Thomas H. Chilton, of E. I. du Pont de Nemours and Company, Wilmington, Del.; Donald B. Keyes, of the University of Illinois; Warren L. McCabe, of the Carnegie Institute of Technology; Walter A. Schmidt, president of the Western Precipitation Company, Los Angeles; Charles A. Thomas, president of the Thomas and Hochwalt Laboratories, Dayton, Ohio.

Division of Medicinal Chemistry: Chairman, Walter H. Hartung, of the University of Maryland; *vice-chairman,* Frederick Fenger, of Armour and Company, Chicago; *secretary,* Russell J. Fosbinder, of the Maltbie Chemical Company, Newark, N. J.; *on executive committee,* George D. Beal, Mellon Institute of Industrial Research, Pittsburgh.

Division of Biological Chemistry: Chairman, Joseph J. Pfiffner, of Parke, Davis and Company, Detroit; *secretary-treasurer,* G. O. Burr, of the University of Minnesota; *on executive committee,* Walter C. Russell, of the New Jersey Agricultural Experiment Station, New Brunswick, N. J.; Arthur H. Smith, of Wayne University; Carrell H. Whitnah, of Kansas State College; Thorne M. Carpenter, of the Nutrition Laboratory, West Roxbury, Mass.

Division of Agricultural and Food Chemistry: Chairman, Roy C. Newton, of Swift and Company, Chicago; *vice-chairman,* Charles N. Frey, of the Fleischmann Laboratories, New York City; *secretary,* Gerald A. Fitzgerald, of the Birdseye Laboratories, Boston; *on executive com-*

mittee, R. Adams Dutcher, of Pennsylvania State College; C. R. Fellers, of Massachusetts State College; H. R. Kraybill, of Purdue University; R. C. Sherwood, General Mills, St. Paul, Minn.

Division of Petroleum Chemistry: Chairman, Per K. Frolich, of the Standard Oil Development Company, Elizabeth, N. J.; *vice-chairman,* J. K. Roberts, of the Standard Oil Company, Chicago, Ill.; *secretary-treasurer,* Cary R. Wagner, of the Pure Oil Company, Chicago; *on executive committee,* Frank W. Hall, of The Texas Company, New York City; Jacque C. Morrell, of the Universal Oil Products Company, Chicago.

Division of Colloid Chemistry: Chairman, Lloyd H. Reyerson, of the University of Minnesota; *vice-chairman,* Ernst A. Hauser, of the Massachusetts Institute of Technology; *secretary-treasurer,* Arthur M. Buswell, of the University of Illinois; *on executive committee,* Herbert L. Davis, of the Institute of Paper Chemistry, Appleton, Wis.; Robert C. Williams, of the Ironsides Company, Columbus, Ohio; Geoffrey E. Cunningham, of Clarkson College of Technology, Potsdam, N. Y.; Ross A. Gortner, of the University of Minnesota; Wesley G. France, of Ohio State University; E. J. Miller, of the Michigan Agricultural Experiment Station, East Lansing, Mich.

Division of Cellulose Chemistry: Chairman, George L. Clark, of the University of Illinois; *vice-chairman,* Melville L. Wolfrom, of Ohio State University; *secretary-treasurer,* William O. Kenyon, of the Eastman Kodak Company; *on executive committee,* Elwin E. Harris, of the Forest Products Laboratory, Madison, Wis.; William F. Henderson, of the Visking Corporation, Chicago.

Division of Rubber Chemistry: Chairman, G. K. Hinshaw, of the Goodyear Tire and Rubber Company, Akron, Ohio; *vice-chairman,* E. B. Curtiss, of R. T. Vanderbilt Company, New York City; *secretary,* Howard I. Cramer, of the University of Akron; *treasurer,* C. W. Christensen, of the Rubber Service Laboratories, Akron; *executive committee,* Archie R. Kemp, of the Bell Telephone Laboratories, New York City; James C. Walton, of the Boston Woven Hose and Rubber Company, Boston; Arthur W. Carpenter, of the B. F. Goodrich Company, Akron; George S. Haslam, New Jersey Zinc Company, Palmerton, Pa.; W. G. Nelson, United States Rubber Company, Detroit, Mich.; Carroll C. Davis, of the Boston Woven Hose and Rubber Company; Seward G. Byam, of E. I. du Pont de Nemours and Company.

Division of Sugar Chemistry and Technology: Chairman, A. R. Nees, of the Great Western Sugar Company, Denver, Colo.; *vice-chairman,* James M. Brown, of the Revere Sugar Refinery, Charlestown, Mass.; *secretary-treasurer,* Edgar W. Rice, of the National Sugar Refining Company of New Jersey, New York City; *on executive committee,* Horace S. Isbell, of the National Bureau of Standards, Washington, D. C.; John C. Keane, of the Utah-Idaho Sugar Company, Salt Lake City, Utah; Raymond M. Hann, of the National Institute of Health, Washington, D. C.; Carl C. Kesler, of Penick and Ford, Cedar Rapids, Iowa; Marshall T. Sanders, of the Atlas Powder Company, Wilmington, Del.

Division of Microchemistry: Chairman, Lawrence T. Hallett, of the Eastman Kodak Company; *vice-chairman,* Clyde W. Mason, of Cornell University; *secretary-treasurer,* George L. Royer, of the Calco Chemical Company, Bound Brook, N. J.; *on executive committee,* Frank Schneider, of Rutgers University; Walter R. Kirner, of the Carnegie Institute of Technology, Pittsburgh.

Division of Paint and Varnish Chemistry: Chairman, William H. Gardner, of the Polytechnic Institute, Brooklyn, N. Y.; *chairman-elect,* Edwin J. Probeck, of the Jones-Dabney Varnish Company, Louisville, Ky.; *secretary-treasurer,* G. G. Sward, of the National Paint, Varnish, and Lacquer Association, Washington, D. C.; *on executive committee,* E. E. Ware, of the Sherwin-Williams Company, Cleveland; Gordon M. Kline, of the National Bureau of Standards, Washington, D. C.; Lawrence K. Scott, of the Jones-Dabney Varnish Company.

Division of Gas and Fuel Chemistry: Chairman, Frank H. Reed, of the Illinois Geological Survey; Urbana, Ill.; *vice-chairman,* H. C. Hottel, of the Massachusetts Institute of Technology; *secretary-treasurer,* Gilbert Thiessen, of the Koppers Company, Pittsburgh; *on executive committee,* R. E. Gilmore, of the Canadian Bureau of Mines, Ottawa; O. O. Malleis, of the Appalachian Coals Company, Cincinnati.

Division of Fertilizer Chemistry: Chairman, Egbert W. Magruder, of the F. S. Royster Guano Company, Norfolk, Va.; *secretary,* H. B. Siems, of Swift and Company Fertilizer Works, Chicago; *on executive committee,* F. B. Carpenter, of the Virginia-Carolina Chemical Corporation, Richmond, Va.; H. R. Kraybill, of Purdue University; F. W. Parker, of the du Pont Ammonia Corporation, Wilmington, Del.; W. H. Ross, of the Bureau of Chemistry and Soils, Washington, D. C.

Division of Water, Sewage, and Sanitation Chemistry: Chairman, A. P. Black, of the University of Florida; *vice-chairman,* O. M. Smith, of the Oklahoma Agricultural and Mechanical College; *secretary-treasurer,* Charles R. Hoover, of Wesleyan University; *on executive committee,* R. C. Bardwell, of the Chesapeake and Ohio Railway Company, Richmond, Va.; Louis F. Warrick, State Board of Health, Madison, Wis.

Division of the History of Chemistry: Chairman, Tenney L. Davis, of the Massachusetts Institute of Technology; *secretary,* Mildred W. Grafflin, of the Hercules Experiment Station, Wilmington, Del.; *on executive committee,* Charles A. Browne, of the U. S. Bureau of Chemistry and Soils, Washington, D. C.; Frank B. Dains, of the University of Kansas; Claude K. Deischer, of the University of Pennsylvania.

Division of Chemical Education: Chairman, Martin V. McGill, of Lorain High School, Lorain, Ohio; *vice-chairman,* Stuart R. Brinkley, of Yale University; *secretary,* Norris W. Rakestraw, of Brown University; *treasurer,* Virginia Bartow, of the University of Illinois; *on executive committee,* B. C. Hendricks, of the University of Nebraska; W. T. Read, of Rutgers University; Otto Reinmuth, of the University of Chicago; O. M. Smith, of Oklahoma Agricultural and Mechanical College.

The group of divisional officers elected Professor George Scatchard, of the Massachusetts Institute of

Technology, as chairman, and Professor Norris W. Rakestraw, of Brown University, as secretary.

Professors John E. Ricci, of New York University; Vincent du Vigneaud, of Cornell University Medical School, and H. B. Vickery, of the Connecticut Agricultural Experiment Station, were elected to five-year terms as associate editors of the *Journal of the American Chemical Society,* while Professor Linus C. Pauling, of the California Institute of Technology, and Dr. George S. Whitby, of the National Research Council, Ottawa, Canada, were reelected as associate editors. Professor Moses Gomberg, of the University of Michigan, was chosen to fill the vacancy caused by the death of Elmer P. Kohler.

Three reelected as associate editors of *Technological Monographs* were: Dr. Walter A. Schmidt, president of the Western Precipitation Company, Los Angeles; Dr. Edward R. Weidlein, director of the Mellon Institute of Industrial Research, Pittsburgh; Fred C. Zeisberg, of E. I. du Pont de Nemours and Company.

W. A. Noyes, Jr., professor in the University of Rochester, becomes editor-in-chief of *Chemical Reviews* on January 1, succeeding Dr. Gerald L. Wendt, of New York City. Named associate editors were: W. S. Calcott, of the du Pont Company; Professor Wendell M. Latimer, of the University of California; Professor W. Conrad Fernelius, of Ohio State University.

New associate editors of the *Journal of Physical Chemistry* are Professor George S. Parks, of Stanford University, and Professor George Glockler, of the University of Minnesota.

Dr. Beverly L. Clarke, of the Bell Telephone Laboratories, New York City, and Thomas R. Cunningham, of the Union Carbide and Carbon Research Laboratories, Niagara Falls, N. Y., were reelected associate editors of the Analytical Edition of *Industrial and Engineering Chemistry.*

Dr. Walter A. Schmidt, of Los Angeles, was named again to the society's Council Committee on Policy for three years.

SPECIAL ARTICLES

HOST-PARASITE INTERACTIONS WITH BACTERIAL WILT OF MAIZE[1]

IT is commonly believed that bacterial virulence in disease is maintained or enhanced by host passage. The constitution of the host is considered to play little part in the ultimate virulence attained. In conformity with Wellhausen's[2] recent studies I propose to show by another technique that such is not always the case.

Virulent strains of *Bacterium stewartii* (E.F.S.) Stevens, (*Phytomonas stewartii* (E.F.S.) Bergey, *et al.*), a vascular, bacterial wilt disease of maize, are characterized by colonies that are large, smooth, spreading and of a mucoid type; avirulent strains are smaller, slightly rough, raised and of a non-mucoid type. Each strain arising from single-cell isolations is constant for colony type and virulence, so that morphological characters may be used to separate individuals with different physiological potentialities.

Mixtures of virulent and avirulent bacteria of varying but known proportions were inoculated into resistant and susceptible inbred lines of maize by injecting the organisms into the growing points of seven-day-old maize seedlings with a hypodermic syringe and needle. The subsequent proportions of virulent to avirulent types may be followed by isolating at suitable intervals of time from the host. For each isolation, lesions from 10 or more plants were macerated together in a small quantity of sterile water and dilution plates poured from this liquid. In order that colony morphology could be classified, only surface smeared plates were used. In six experiments isolations were made each 4 days after inoculation; in seven other experiments isolations were made only at the end of the experiment. Total passage time varied from 14 to 20 days.

There is a correlation of $r = 0.95 \pm 0.02$ between the ratio of virulent and avirulent bacteria in the inoculating suspension and the ratio obtained by isolating from the first definite lesion. This shows that the bacteria which actually grow and produce a diseased condition are reliably estimated by plating directly from the inoculating medium.

Upon passage through the susceptible host there is a differential selection for the avirulent type of bacteria. For example, beginning with a 50–50 proportion of virulent to avirulent bacteria, the proportion observed after a 15-day passage averaged 39–61. The rate of this change during host passage is dependent upon the initial proportion of virulent to avirulent bacteria in the inoculating medium. The rate of change is slow in a population containing a high proportion of avirulent organisms. When these rates of change are plotted against the initial proportion of avirulent bacteria in the inoculating medium, the slope or regression of these rates is linear and equal to -1.1 (Fig. 1—line A).

Passage through the resistant host results in a differential selection for the virulent type of bacteria, instead

[1] Journal Paper No. J-596 of the Iowa Agricultural Experiment Station, Genetics Section, Project 404.

[2] E. J. Wellhausen, *Phytopath.*, 27: 1070–1089, 1937.