

cloudy, rainy and clear—presents, I believe, a genuine surprise (see Fig. 3). This figure is to be interpreted in the same manner as the others. From it we see that misdemeanors are less frequent upon cloudy and rainy days (latter under 'Precipitation' marked '+ .01' in.) than upon those which we are accustomed to consider more agreeable. In fact, of all the classes of data studied, that for error in banks is the only one showing an opposite result. Reference to the curves shows that for assault by males (Assault M) the greatest excess occurred upon days characterized by the Weather Bureau as partly cloudy. Such days have from 4/10 to 7/10 of the hours from sunrise to sunset obscured, fair days having more than that amount of sunshine and cloudy days less.

Perhaps the most surprising curve is that for suicides, showing as it does that those who are weary of life choose the fair day, upon which there is no precipitation as the time for ending an unhappy existence. This, together with the fact that the months of May and June show the fullest record of suicides of any of the year, is directly contradictory to what seems to be the accepted opinion upon such matters. Perhaps fiction is largely responsible for the prevailing idea, and fiction would certainly lose much of its thunder if the proverbial gloomy weather could not be brought in for tragic effect. The prevailing climate may, however, influence these results, as the study for Denver (see 'Suicides' Denver upon the figure), where cloudy days are something of a rarity, their effect seems to have been more disastrous upon the suicide. There an excess of 32% is indicated for such days. The social conditions there, are, however, somewhat peculiar, as the population contains a large number of people who have gone to the region in search of health, which the sunshine was depended upon to restore, and the discouragement of even a brief dep-

rivation of its presence was too great to be borne. Even the death rate is shown by the curves to be slightly higher during bright weather, although the difference for days of varying character is not great.

Perhaps the most interesting general conclusion to be drawn from the study is that during those meteorological states which are physically exhilarating, excesses in deportment, in the ordinarily accepted sense of the word, prevail to an abnormal extent, while death and irregularities in mental processes (error in banks) are below expectancy. During such weather conditions, without doubt the quality of the emotional state is more positive than under the reverse conditions, but the results seem to show that in the long run an excess of energy is a more dangerous thing, at least from the standpoint of the police court, than the worst sort of a temper with no energy.

EDWIN G. DEXTER.

SCIENTIFIC BOOKS.

SOME RECENT WORKS ON MECHANICS.

Theoretical Mechanics, An Introductory Treatise on the Principles of Dynamics, with Applications and Numerous Examples. By A. E. H. LOVE. Cambridge, At the University Press. 1897. 8vo. Pp. xv + 379.

Vorlesungen über theoretische Physik von H. von Helmholtz. Herausgegeben VON ARTHUR KÖNIG, OTTO KRIGAR-MENZEL, FRANZ RICHARZ, CARL RUNGE. Band I., Abtheilung 2. Die Dynamik discreter Massenpunkte, herausgegeben von Otto Krigar Menzel. Leipzig, Verlag von Johann Ambrosius Barth. 1898. 8vo. Pp. x + 380.

One of the most original and suggestive of recent works on theoretical mechanics is the treatise on dynamics of Professor Love. The merits of this important book arise naturally from the author's point of view, and we are prepared to expect something more than stereotyped forms on reading in his preface that "The works which have been most useful to me in

connection with matters of principle are Kirchhoff's *Vorlesungen über mathematische Physik* (Mechanik), Pearson's *Grammar of Science*, and Mach's *Science of Mechanics*. This last should be in the hands of all students who desire to follow the history of dynamical ideas." We are still more interested to examine the book when we read in the introductory paragraph that "Mechanics is a natural science; its data are facts of experience; its principles are generalizations from experience. The possibility of natural science depends on a principle which is itself derived from multitudes of particular experiences—the 'Principle of the Uniformity of Nature.' This principle may be stated as follows: Natural events take place in invariable sequences."

From this classification of mechanics along with the natural sciences one may correctly infer that the work is more concerned with the facts than with the formulas of the subject. Indeed, the old notion, still held by many, that mechanics is simply a branch of applied mathematics whose data are as unquestionable as the data of Euclidean geometry, finds no tolerance here. On the contrary, one of the most important features of the work consists in its critical examination of the postulates and principles of mechanics and their range of applicability to matter as we know it. The doctrine of relativity of motion, force, etc., so generally overlooked or ignored in works on dynamics, is here considered with much particularity; well-known results are presented in clearer lights, and many new or less well-known results are to be found in every chapter. In short, the work is a thoroughly progressive and instructive treatise which will bring pleasure and profit to any energetic student of mechanics.

The book is divided into three parts embracing in all thirteen chapters. The first part, including the first four chapters, deals with kinematics; the first chapter being devoted to definitions, the second to vectors, the third to displacement, velocity and acceleration, and the fourth to applications of kinematical principles. A novelty of nomenclature introduced here with apparent advantage is the word 'frame,' or the phrase 'frame of reference,' in place of 'axes' or 'coordinate axes,' though

one may doubt the desirability of such a change of terms unless it can be made in other applications of coordinate geometry as well.

The second part, Chapters V. to VIII., is devoted to the principles of dynamics. Herein there is a notable departure from the plan of treatment followed in most English texts. There is less of the appearance of formal deduction and more of the reality of simple induction. This method leads, by an appeal to observation and experiment, to the essential concepts of mass and force, and thence to the equations of motion of a free particle. The laws of motion of Newton are not incorporated in the text, but are commented upon in a note at the end of Chapter V. General theorems concerning the motions of masses are considered in Chapter VI.; systems of forces are treated in Chapter VII., and Chapter VIII. is devoted to work and energy. A new and commendable term, namely, 'kinetic reaction,' appears in this part for the first time, apparently, in a text-book. This may well replace the 'expressed force,' 'force of inertia,' etc., of earlier writers. A critical note at the end of Chapter VIII. is well worth examination by advanced students of the science.

The third part of the work, Chapters IX. to XIII., deals with methods and applications. These cover about 120 pages, and a large variety of solved and unsolved problems is set before the reader. Chapter IX. is occupied with free motions of particles, X. with constrained motion, XI. with coplanar motions of a rigid body, XII. with miscellaneous methods, and XIII. with relative motion and gravitation. Much space is given in these chapters to impulsive motions and to the intricate questions of initial motions, and a considerable portion of Chapter XII. is devoted to the interesting subject of the motions of strings and chains. A short appendix deals with the questions of units and their dimensions.

The work appears to be subject to the following minor criticisms: Too little space is given to kinetics in three dimensions. On p. 96 there is a definition of the law of gravitation which will lead the incautious reader to adopt the common but erroneous notion that the gravitation constant is a mere number, that is, a quan-

tity independent of the units of length, mass and time. And this leads to the remark that in didactic treatises it is best for the author as well as the student to make constant use of the theory of dimensions. On pp. 258, 260, 262, we find the phrase 'impulsive pressure' used as a synonym for momentum and impulse. This is plainly a slip of the pen, since the equally objectionable 'impulsive force' of the older writers finds no favor with the author. Here again, and also in the phrase 'angular momentum,' which the author seems to sanction as the equivalent of 'moment of momentum,' the theory of dimensions points the way to precision of terminology. Lastly, a book so full of excellencies should have a much fuller index, some comparatively new terms like dissipative forces, motional forces and positional forces being omitted or given only indirectly, and the important name of Mach being overlooked altogether.

With commendable admiration for their great master, the editors of the series of volumes to which the one before us belongs have undertaken to present in printed form the lectures on mathematical physics delivered by Helmholtz in the later years of his life. In doing this they are doubtless fulfilling a pious duty, but they are also assuming a serious task, for no one short of a master is fitted to elaborate the lectures of a master. As regards the present volume, on the dynamics of discrete particles, the task of the editor was not specially difficult, since the subject has been pretty thoroughly wrought out during the past two hundred years. In fact, much of the matter in this volume would not be worth publishing at all in such a series if it did not possess here and there the impress of the master's originality.

The book is divided into four parts. The first part deals with the kinematics of a point, the second with the dynamics of a material point, the third with the dynamics of a material system, and the fourth is devoted to the general principles of dynamics, including statics as visualized in the principle of virtual displacements, and the methods of d'Alembert, Lagrange and Hamilton in kinetics.

The first part presents little that is novel, and

is quite insufficient for the needs of anything beyond elementary work in kinematics. The most important theorems of the subject are not even alluded to. The second part establishes the equations of motion of a free particle by the aid of Newton's laws, and devotes an undue amount of space to the simplified case of a 'falling body' without disclosing anything of its essential complexity. Then follow seventy-seven pages treating of oscillatory motions, including simple harmonic and damped vibrations and the theory of the simple pendulum moving in a plane or cone. Much of this space is rather dreary in its prolixity, but the physicist will find the sections treating of damped vibrations and forced vibrations well worth reading.

The third part sets down the equations of motion of a system of masses by aid of the principle of equality of action and reaction whereby the internal forces of the system are seen to be self-balancing. Then follow the well-known theorems concerning the motion of translation of the centroid of the system and of its rotation about axes through the centroid. The notation used here is needlessly complex; but the following section, which deals with the very important subject of moments of inertia, is rendered repulsive by reason of a violent and quite useless departure from current notation. Why should a subject so old (dating from Segner and Euler) and so intrinsically difficult be encumbered by a strange notation when nothing new is presented?

The remainder of the third part is devoted to the principle of energy and to an elementary presentation of the theory of planetary motion. The forty pages allotted to the doctrine of energy are chiefly interesting for their historical matter and for the author's physical conceptions, while the thirty-six pages in which Newton's problem of two bodies is treated afford an easy introduction to dynamical astronomy.

For the advanced student of mechanics the fourth part of the book will be found most interesting and instructive. It is in this part that the editor presents the author's latest views on the generalities of the science. There is not much herein that is new; but the student

who is unacquainted with Helmholtz's modes of thought will find it well worth the effort essential to master the connected exposition here given of the comprehensive methods of d'Alembert, Lagrange and Hamilton. Many readers will encounter a difficulty in an unusual and, apparently, an unhappy notation, considering the precedents set long ago by Lagrange. Those to whom English is the mother tongue will also be pained at the ease with which the old and the new terminologies are mixed. But these are minor matters in comparison with the clear physical concepts and the penetrating analytical processes which characterize the work of the great author. This last part, which comprises a little more than one-fourth of the bulk of the book, is divided into four chapters. The first of these treats of statics from the point of view of virtual displacements and as the vanishing case of kinetics. The second treats of kinetics, giving especial attention to the equations of d'Alembert, Lagrange and Hamilton, the author's well known preference being expressed for the Hamiltonian form of equation. The third chapter deals with the applications furnished by rigid bodies, including the theory of the top and the theory of terrestrial precession in their elements. The last chapter is devoted to the application of dynamical principles to non-conservative systems. It is especially noteworthy for certain reciprocal relations (*Reciprocitätsgesetze*) shown to hold between pairs of partial derivatives of the external forces with respect to the corresponding velocities and accelerations; several important physical applications of these relations being cited.

R. S. W.

Social Phases of Education in the School and the Home. By SAMUEL T. DUTTON, Superintendent of Schools, Brookline, Mass. New York, The Macmillan Company. Pp. viii+259. Price, \$1.25.

This volume consists of "lectures given during the past two years at Harvard, Chicago and Boston Universities, and papers read before the American Social Science and the National Educational Associations." The author says that "the point of view is in all cases social rather than scholastic, and the ideas emphasized are

as worthy of consideration by parents as by teachers." Indeed, the chief value of the book is that it gives a popular interpretation of some current ideas in educational thought. Teachers of all grades will find it helpful and stimulating, and there is enough sound educational theory at the bottom to make it a safe guide to parents.

Mr. Dutton takes as his thesis the idea that the school is a form of social life. Its purpose is to minister to the support of the home and to render service to human society, or to socialize the youth and to fit him to take his place in society and to render the best service of which he is capable. In the thought that "the object of the school is to socialize the child, to make him acquainted with his environment and conscious of his obligations to others," is to be found the clue to Mr. Dutton's educational practice. He believes in emphasizing the 'preparation for vocation' as an aim of the school, because he believes in work—that 'useful activity' which best conserves 'man's physical, moral and spiritual welfare.' He believes in 'general culture,' the kind that fits one to live more efficiently and helpfully day by day, the kind that makes one a better man or woman and renders one more serviceable. With this idea in mind he looks upon the old school curriculum as meagre and narrowing; he advocates more of physical and manual training and of the domestic and fine arts, "not only because they touch the elemental wants of mankind, but because they connect the school and the home, create a close sympathy between parents, teachers and pupils, and tend to level up whole communities where the less fortunate reside." As for other studies the criterion of excellence must always be the part they play in human life and the service they render to society. This social aim even determines the methods to be employed in teaching—"the governing principle of the recitation should be, not competition, but cooperation;" it should enter into the home life and the management of children in school—"thus, every pupil becomes actively interested not only in being courteous, orderly and helpful himself, but in having his associates combine with him in this social effort." For this reason

the author advocates some form of self-government in home and school, the cooperation of church and school in educational work, the correlation of educational forces in the community, and in the closing chapter he very properly gives an account of the Brookline Education Society and its work—a work in which Superintendent Dutton may well take pride.

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Who's Who in America? A Biographical Dictionary of Living Men and Women of the United States, 1899–1900. Edited by JOHN W. LEONARD. Chicago, A. N. Marquis and Company. Sm. 8vo. Pp. xxxii + 822. Price, \$2.75.

Under the somewhat flippant title borrowed from a useful English publication, Mr. Leonard and his publishers have put forth a notably compact, convenient and scholarly hand-book, at once an autobiographic cyclopedia and a directory of eminent living Americans. The biographic sketches are models of symmetry and condensation, and may be accepted as trustworthy, since the information in nearly all cases was obtained from the persons themselves or from their families, frequently through repeated effort and prolonged correspondence. The delicate and difficult task of selection, or of assorting the 8,602 eminents out of the seventy-odd millions of residuary population, seems to have been performed with great discrimination and fairness, with the assistance of a considerable corps of advisers in special lines of activity. The dictionary-directory is supplemented, and its scholarly air enhanced, by introductory chapters on 'Educational Statistics' and 'Birth and Residence Statistics,' which are real contributions to knowledge of national characteristics; and there is an extended 'Necrology,' in which are listed prominent men and women of America deceased since July 1, 1895. The book-making is admirable for the purpose; the volume is convenient in size and form, distinctive and serviceable in binding, suitable in paper, and well-adapted in typography; while the proof-reading is, in view of the predominance of proper names, remarkably good—the critic for *The Nation* notes but a single error. So, on the

whole, the book is as comfortable as it is necessary to those who wish to know something of their contemporaries.

The hand-book ought to be particularly helpful to scientists and educators, partly as an up-to-date directory, partly because it gives prominence to distinction in their lines of intellectual activity, perhaps more satisfactorily than any other biographical work extant. Among the few categories of eminents introduced on arbitrary lines are all members of the National Academy of Sciences, and all heads of the larger universities and colleges; and examination of the pages indicates that fully a thousand eminents, or an eighth of the whole, are distinguished for original investigation, frequently combined with teaching, while something like half as many more come in as educators alone. The inclusiveness of the book, as regards scientific men, is indicated by the proportion of entries to the editorial corps of our leading journals of investigation, selected nearly at random: *e. g.*, of the twenty editors and associate editors of *SCIENCE*, and of the eleven of the *American Journal of Science*, all appear in the book; of the ten editors of the *American Anthropologist*, all appear except the one foreign member of the board; of the editorial corps of the *National Geographic Magazine*, twelve out of thirteen appear, and of that of the *American Geologist*, eleven out of twelve; while twelve out of the fourteen American editors of the *Journal of Geology* find place.

The educational tabulation is especially suggestive, and the fact that fully half of the eminents were educated in universities and colleges arises as a new argument for thorough education. The distribution of eminence, too, is of much interest. Naturally New York (State) stands first, with 2,039 or twenty-four per cent. of the whole; Massachusetts and the District of Columbia follow almost together, the former with 742 and the latter with 724; Pennsylvania holds fourth place with 622, closely approached by Illinois with 564; then there is a considerable drop to Ohio with 321, followed by New Jersey in the seventh place with 296; then come California with 210, Connecticut with 193, and in the tenth place Missouri with 171; the remaining States with quotas exceeding 100 are Michigan, 144; Mary-

land, 142; Minnesota, 125; Iowa, 121; Indiana, 111; Wisconsin, 108; Tennessee, 105, and Virginia, 102. The comparison between birth-place and present location is equally interesting, illustrating as it does the westward drift, the concentration in States of large cities, and the disadvantage of foreign birth in the race for accomplishment.

No occasion for criticising the book appears, though it may be suggested that its convenience might be increased in future editions by printing both the ordinary form of writing the name and the full forename in parentheses, after the manner adopted (but afterward abandoned on pecuniary grounds) by the Joint Commission of the Scientific Societies of Washington, thus: Gordon, Professor J. C. (Joseph Claybaugh). But even without this refinement, the book is admirably complete and convenient.

W J M.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *American Journal of Science* for August contains the following articles:

Rotatory Polarization of Light in Media subjected to Torsion, by A. W. Ewell.

Lichenaria typa W. & S., by F. W. Sardeson.

Studies in the Cyperaceæ, XI., by T. Holm.

Constitution of Tourmaline, by F. W. Clarke.

Determination of Tellurous Acid in presence of Haloid Salts, by F. A. Gooch and C. A. Peters.

Iodometric Method for the Estimation of Boric Acid, by L. C. Jones.

Method for the Detection and Separation of Dextro- and Levo-rotating Crystals, with Some Observations upon the Growth and Properties of Crystals of Sodium Chlorate, by D. A. Kreider.

Devonian Interval in Northern Arkansas, by H. S. Williams.

Note on a New Meteoric Iron found near the Tombigbee River, in Choctaw and Sumter Counties, Alabama, U. S. A., by W. M. Foote.

Orthoclase Crystals from Shinano, Japan, by C. Iwasaki.

SOCIETIES AND ACADEMIES.

BOTANICAL SOCIETY OF AMERICA.

THE fifth annual meeting of the Society will be held in Columbus, Ohio, August 18 and 19, 1899.

The address of the retiring President, Dr. N. L. Britton, upon the subject: 'Report of Prog-

ress of Development of the New York Botanical Garden,' will be given in the Chapel, University Hall, Friday evening at 7:30 o'clock. The lecture will be illustrated with lantern views. On the following day, Saturday, the regular sessions for the reading of papers will be held in Room 17, Townshend Hall, at 10 a. m. and 2 p. m. The following papers are already announced for the meeting, and others are to be expected when the full program is made up by the Council.

'Apetaly and Dicciousness,' Charles Edwin Bessey.

'The Spore Mother Cells of Anthoceros,' Bradley Moore Davis.

'Symbiosis and Saprophytism,' Daniel Trembly MacDougal.

'The Effect of Centrifugal Force upon the Cell,' David Myers Mottier.

'The American Species of *Arisæma*,' Nathaniel Lord Britton.

'The Uredinæ occurring upon *Phragmites*, *Spartina* and *Arundinaria* in America,' Joseph Charles Arthur.

'Some notes upon Distribution of American *Erysipheæ*,' Byron David Halsted.

'Gametes and Gametangia of the *Phycomycetes*,' Bradley Moore Davis.

The first meeting of the Council will occur at 2:00 p. m., at the Chittenden Hotel, and the first business meeting, according to custom, at 4:00 p. m., in Townshend Hall, Room 17. A business meeting for the election of officers and new members and for the transaction of other business will be held at 9:30 a. m., Saturday.

GEO. F. ATKINSON,

Secretary.

DISCUSSION AND CORRESPONDENCE.

ANAGLYPHS AND STEREOSCOPIC PROJECTION.

AFTER an enthusiastic period some twenty odd years ago the interest in stereoscopic views suffered a reaction. The interest has been lately reawakened in many ways. In *SCIENCE* Professor Jastrow has already discussed some stereoscopic methods; in *SCIENCE* for July 14th of this year Mrs. C. Ladd Franklin makes special mention of pictures printed in two colors and urges the adoption of a method of stereoscopic projection. The following account may, perchance, contain some minor bits of information not already well known.