reforming the world's calendar, by Honorable J. M. C. Smith, of Michigan.

It is gratifying to learn that the movement for Calendar Reform is thus taking on definite shape; and also that, from the writer's viewpoint, the bill referred to embodies the feature of dividing the year into thirteen lunar months, thus assigning to the moon her rightful place in determining her share of time division in the calendar.

It would appear to be sufficiently obvious without special mention, that it must be futile for any individual government to undertake a reform of the world's calendar without the cooperation of the other principal civilized nations; and that any legislation that may now be projected along that line should be with the object of securing such cooperation.

It may be suggested also that the movement might better be deferred until the present world agitation shall have subsided.

T. G. DABNEY

CELLULOID FOR COVER GLASSES

TO THE EDITOR OF SCIENCE: War conditions are causing many substitutes to be used, and even I was forced to one by the scarcity of cover glasses for microscopic work. I found that sheet celluloid can very well be used in place of the glass, the fiber thereof being practically negligible for beginning work. I take sheet celluloid, cut strips about the width of the slide, iron these strips flat (place the heated iron over each part but do not rub, for rubbing the iron causes other streaks), and then cut the strip into small squares. In addition to being unbreakable and so quite durable and inexpensive, they can not scratch the lens by the pupil running the objective into the coverslip, as beginners are prone to do with all cautions about such dangers forewarning them. Other science teachers may find this expedient worth trying. F. A. VARRELMAN

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AN ABSOLUTE SCALE FOR RECORDING TEMPERATURE

TO THE EDITOR OF SCIENCE: I think the suggestion of Dr. Marvin in a recent number of SCIENCE (15 March, 1918) with reference to the adoption of an approximation to the absolute scale of recording temperatures is a good one. Two suggestions occur to my mind in trying to devise an appropriate name for this scale. As it is a combination of the Absolute and the Centigrade the word "Abcent" composed of the first syllable of each word seems to give a fitting term. An alternative would be to call it the "Thomson" scale, a name which would signify that it closely resembles the Kelvin or absolute scale but is not quite the same. As is well known, Lord Kelvin's earlier name was Sir William Thomson. J. ADAMS

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SCIENTIFIC BOOKS

Calculus. By HERMAN W. MARCH, Ph.D., Assistant Professor of Mathematics, University of Wisconsin, and HENRY C. WOLFF, Ph.D., Assistant Professor of Mathematics, University of Wisconsin. McGraw-Hill Book Company, New York, 1917. Pp. xvi + 360.

Differential and Integral Calculus. By CLYDE E. LOVE, Ph.D., Assistant Professor of Mathematics, University of Michigan. The Macmillan Company, New York, 1916. Pp. xviii + 343.

Plane Trigonometry with Tables. By EUGENE HENRY BARKER, Head of the Department of Mathematics, Polytechnic High School, Los Angeles, California. P. Blakiston's Son and Co., Philadelphia, 1917. Pp. 172.

College Algebra. By ERNEST BROWN SKINNER, Assistant Professor of Mathematics, University of Wisconsin. The Macmillan Company, New York, 1917. Pp. vi + 263.

Projective Geometry. By L. WAYLAND DOWLING, Ph.D., Associate Professor of Mathematics, University of Wisconsin. McGraw-Hill Book Company, New York, 1917. Pp. xiii + 215.

Elliptic Integrals. By HARRIS HANCOCK, Professor of Mathematics in the University of Cincinnati. John Wiley and Sons, New York, 1917. Pp. 104.

Of the making of many text-books of mathematics for colleges and secondary schools there

is not only no end but no very evident diminution. The phenomenon is interesting, especially in view of the gravity of the times so unfavorable to the customary pursuits of scholars. No doubt the explanation involves a wide variety of considerations. One of these is the purely commercial competition among publishers who invite cooperation of teachers in the making of books. Another is the fact of a certain inertia acquired before the war: for example, no less than four of the above-listed volumes belong to series of publications initiated in times of peace or at all events prior to the entry of the United States into the world conflict. A third consideration relates to numbers: the number of persons in the country who are devoted to the teaching of mathematics or to mathematical research or to both is large; it is absolutely large and it is large relatively to the number of those similarly engaged a generation or two ago; the membership of the American Mathematical Society includes more than seven hundred; that of the recently organized Mathematical Association of America, more than a thousand; and there are in various sections of the country other flourishing associations of teachers of mathematics: it goes without saying that where there are many persons competent to write books many books will be written.

No doubt the more intimate personal motives to the writing of mathematical text-books are various. The hope of pecuniary reward is probably not very effective, at least not effective with many, if by hope we are to understand desire plus expectation. What may be called the reputational motive is doubtless more powerful: there is a general expectation that college and university instructors will be productive scholars; owing to a variety of circumstances the production of text-books is apt to seem an easier, albeit a less effective, way to meet such expectation than is the way of research. Then there is the altruistic motive—the impulse to serve; it is certain that this motive is frequently present and sometimes dominant: mathematical text-books are sometimes written to advance the cause of mathematical education. It is probable that the principal motive to the kind of activity in question is really hedonic, consisting in the peculiar pleasure that is felt in trying to perform an approved task of great difficulty or—to view the matter in another aspect—in trying to win, in competition, an exceedingly difficult game. Surely there is here ample room for the play of that motive, for it is not easy to imagine an undertaking more beset with difficulties than is the writing of a mathematical text-book that is to be at once excellent in quality and successful in its appeal for public approval. The suffrages of teachers must be won. But teachers vary enormously in respect of scientific competence. The extremes are widely sundered. One of them is represented by the reactionaries, by those whose knowledge is less a knowledge of subject-matter than of traditional ways of presenting it and who are naturally opposed to every innovation of theme or of method. The other extreme is represented by the fadist, the ultra modern, the clamorous reformer whose creed is that whatever is is bad, who confuses the novel with the good, and pursues the new, because it is new, with irrational zeal. Another difficulty is the question of size: how big ought the book to be? The question is puzzling because in our schools there is no uniformity of standard or of practise regarding the amount of time devoted to a given subject. A yet more perplexing question is that of presuppositions: what degree of intellectual maturity and what degree of scientific preparation ought to be presupposed in the pupils for whom the book is designed? Such is our lack of uniformity of standards that an answer that is right for one institution or one locality will be wrong for another, and so the author is obliged to guess and to compromise. Not the least interesting part of the game, and a part that is especially fascinating, because it can never be managed quite successfully, is the part requiring the author to minister at once to the culture interests and the efficiency interests of his readers; for the two interests can not be harmonized nor made identical by the easy device of stoutly denying their difference. Again, the necessity of adjusting the

claims of the theoretician, on the one hand, and the practician, on the other, furnishes the mathematical text-book writer with a perpetually fascinating problem; for the theoretician and the practician have nothing in common save their insistency; in other respects they are as wide apart as the poles; the theoretician is a rigorist, a logician, a lover of the abstract, demands a minimum of assumption and a maximum of proof; the practician hates the abstract, loves the concrete, and mainly depends for his happiness on getting results by the use of rules and formulas that he neither understands nor cares to understand. To win the unqualified approval of both these types of critic is impossible, a contradiction in terms; to incur the unqualified condemnation of both is not impossible; the target to be aimed at is somewhere between; to locate it and to hit it squarely—two very different things—require a rare combination of sanity, skill and good luck.

It may be added that in these times the text-book writer receives additional stimulation from the keen competition of other subjects and from the challenge of certain cunning educators who have shrewdly discovered that the educational value of mathematics has always been greatly overestimated.

The aim of Professors March and Wolff has been to present "the calculus in such a way that it will appeal to the average student rather as a means of studying scientific problems than as a collection of proofs and formulas." The aim is commendable but in saying so we do not intend to imply, and the authors would probably not contend, that the calculus must appear either as such a "means" or as such a "collection" for it has other aspects, aspects both attractive and worthy. Integration is introduced at an early stage. In connection with the employment of infinitesimals, Duhamel's theorem is used but without too much finesse. There are numerous applications to elementary classical problems of geometry, physics and mechanics. A brief introduction to analytical geometry of three dimensions is inserted for such readers as may require it. The phrasing is in general so careful and so good that its very excellence operates as a challenge, and one is tempted to ask whether it would not be a trifle better to say that the phrase, division by zero, is meaningless than to say (p. 30) that "division by zero is an impossible operation"; to say that the fraction, $(x^2-4):(x-2)$, has no value for $x=2$ than to say "its value is not determined at this point"; to say in such a case that there is no quotient than to say that "the quotient has no meaning." The volume closes with a very brief chapter dealing with simple types of differential equations.

To differential equations Professor Love devotes three chapters amounting to more than fifty pages. Integration is not presented earlier than page 116. This is preceded by a chapter on curve tracing. The reader is impressed with the possibility of calculating the most important mass-moments of first and second order by means of simple integration. Applications are drawn exclusively from geometry and mechanics with unusual emphasis on the latter. The importance of checking results, particularly in integration problems, is stressed. An excellent feature is the presence of "worked examples" to assist the reader in making transition from theory to practise. In Professor Love's book as in that of Professors March and Wolff the fundamental theorems respecting limits are set down without proof.

In Mr. Barker's book we have a pretty plain specimen of plane trigonometry. Trigonometric series are not present. Of the wider bearings and higher attachments of the subject the reader is not made aware. Much attention is rightly given to simple applications. The large page and open type please the eye. The punctuation is unusual and not consistent with itself. The radian is defined as if it must be conceived as always having its vertex at the center of a circle. The words "these" and "this" (pp. 2, 3) are assigned to duties that they are unable to perform. In article 4 one is at a loss to determine the significance of the repeated phrase, "said to be." The author has sometimes allowed himself the freedom of such colloquial expressions as "Expand the left members and we have" (p. 86).

Physically, mechanically and stylistically Professor Skinner's College Algebra is a tidy piece of work. It is up-to-date in its inclusions, exclusions and emphases. Its early use of geometric representation is happy. The notion of function occupies a dominant place in the entire perspective. In the definition of this notion (p. 49) the meaning of the term "known" may lead to interesting dialectic, especially if the function be implicit. Five convenient tables are inserted at the end of the volume.

Professor Dowling's "Projective Geometry" is a handsome introduction to the most exquisitely beautiful of mathematical subjects. The treatment, which is in the manner of Reye's classic "Geometrie der Lage," is synthetic as distinguished from algebraic, and presupposes no knowledge beyond ordinary elementary geometry and a very little trigonometry. It does not aim at the rigor of the postulational method, but is preliminary thereto and admirably qualifies the reader to appreciate the nature and the value of that method.

In his "Elliptic Integrals" Professor Hancock has compressed a large amount of matter into a small compass. If the work be too compact for most of those who would like to read it, the fault is not that of the author but rather that of the editors who desired him to write a work which "shall relate almost entirely to the three well-known elliptic integrals, with tables and examples showing practical applications, and which shall fill about one hundred octavo pages." This assigned task has been done faithfully, and the reader will thank the author for his full citation of the literature of the general subject.

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SPECIAL ARTICLES

INHERITANCE OF WINTER EGG PRODUCTION

PRELIMINARY REPORT

A. Progeny of a Cornish Male.—A Cornish male was mated *simultaneously* to several (5) Rhode Island Red hens of high fecundity families with a mean winter production of 52.5 eggs and to several Cornish females. The latter are poor winter layers with a mean of 8.47 eggs. There were 33 pullets from the Cornish and Rhode Island Red cross with a mean winter production of 49.2 eggs, the range being 21–86.

The offspring of this male with pure Cornish females were 11 in number and with the exception of a single individual were poor winter layers, the average of all being 11.6 eggs.

The result from the Cornish male and Rhode Island Red female cross is diametrically opposed to that obtained by Pearl from Cornish males (of the same strain that I used) bred to Barred Plymouth Rock females which are good winter layers. The offspring of this cross gave a mean winter production of 16.7 eggs. The reciprocal cross, viz., Barred Rock males and Cornish females, gave an average winter production of 30.7. We have no data at present from the corresponding cross with Rhode Island Reds. It is clear from the results of my experiment that high-producing hens are able to transmit this ability directly to her daughters, that is, high fecundity in Rhode Island Reds is not sex-linked.

B. A Theory of the Inheritance of Winter Egg Production Alternative to Pearl's.—It has been found that the observed ratios in which high and mediocre producers occur, both in Pearl's data on Barred Plymouth Rocks and my own with a large series of Rhode Island Reds, can be explained satisfactorily by assuming that high egg production depends upon two factors that follow the usual dihybrid Mendelian scheme. One factor alone, in either simplex or duplex condition, is assumed to give mediocre production. This theory encounters only one difficulty, viz., in a few instances there is a deficiency in the expected numbers of high producers, a result easily explicable with a physiological character such as egg production. Pearl's theory, however, encounters the reverse difficulty, *i. e.*, high producers appear where none are expected. This difficulty is explained by Pearl on the very reasonable assumption that it is due to an overlapping of phaenotypes.