

al work. The designs before us err in this way. Even the letters are too much alike. That is a pretty E that has been chosen from sixteenth-century work or designed new; but why should all the E's be the same? Even in printing with movable type a dozen forms of M or S will be found in a single book of the sixteenth century. And in hand-work—engraving or pen-work—the designer ought to revel in the chance of varying the forms of his letters.

'Dora' is an idyl of the sort which should lend itself well to illustration. Randolph Caldecott, Charles Keene, some artist who had studied the English farmer and laborer, village and countryside, would have made a charming thing of a little series of pictures to the gentle, tranquil, rather vague and feeble, but still genuine, poem. Mr. W. L. Taylor's illustrations do not seem to us full of English rural life: they are perfunctory; the smockfrocks and other costumes may pass, but the setting is not characteristic. The pictures are not uninteresting, even if there is a deal of false drawing in them: Dora standing on Mary's threshold, with the poor interior dimly seen through the doorway, is as pretty a bit as needs be. With it should be contrasted the large cut of William's quarrel with his father, where there is nothing that can be praised. The value of most of the illustrations lies between these two.

It is hard to award a place in literature to such very domestic and very maternal verses as these of Mrs. Brine's:

"Gayly the robin his morning song sings,
Pluming and stretching his feathers and wings;

O! many the beautiful things that I see,
But fairest of all things is baby to me!"

And these, when the baby goes astray in the fields—

"Yonder I see her, my own straying lammie,
Sun-kissed and breeze-blown; the bright tangled curls,
Crowned with the blossoms and leaves she has gathered,

This queen of all blossoms, my dearest of girls."

These are fair average specimens of the poem in question. The illustrations are easier to criticize. The seven full-page cuts are printed in black ink in the usual fashion, and are very sweet and refined compositions of no great originality of conception. The child who figures in them all is a very real and solid one; she is always alone with the landscape or with her playthings, until she is kissed "good-night" at last. We know her better from the pictures than from the verse, and we like her very much. The pages of text are "flourished around" with little scraps and sketches from nature, printed in the palest gray, not important nor very well drawn, but enclosing two or three little pictures in black which are sweet and dainty, and as many that are less good. But, on the whole, it is the pictures that save the book and make it worth buying and giving.

RECENT MATHEMATICAL WORKS.

Nos. 3 and 4 complete the eighth volume of the *American Journal of Mathematics*. It is alike difficult and unnecessary to characterize their contents in terms intelligible to the general reader. Its articles are mile-stones in the path of progress in the mathematical science of the nineteenth century. For the benefit of those whose training and pursuits fit them to understand the journal, and who, if any such there be, have not yet become subscribers, we will mention two or three articles.

Ten lectures on the theory of reciprocants by the former editor of the *Journal*, Prof. J. J. Sylvester, form the chief ornament of No. 3. A paper by Charlotte Angas Scott, of Bryn Mawr College, affords sufficient evidence that the female intellect is at least competent to treat questions which many a worthy college professor of

the male sex might without shame confess were beyond his depth. The name of M. H. Poincaré is well known to the readers of foreign mathematical journals. A paper by him, in the French language, "Sur les Fonctions Abéliennes," is well adapted to those who seek recreation in the integral calculus, and occupies the larger part of No. 4. But the paper which, if we mistake not, will attract the widest attention, because of its practical bearing, is a "Generalized Theory of the Combination of Observations so as to Obtain the Best Result." It will be especially interesting to those who have read Mr. T. W. Wright's 'Treatise on the Adjustment of Observations,' which was reviewed in the *Nation* about a year ago.

When last year we noticed briefly the first volume of the third edition of Prof. G. M. Minchin's 'Treatise on Statics' (Clarendon Press Series, Macmillan), we ventured to predict that when the second and concluding volume of the work appeared, we should probably have the most complete and satisfactory treatise on statics in the English language. The second volume is now before us, and it not only justifies our prediction, but the limitation to the English language may, perhaps, be removed. The words "revised and enlarged" on the title-page have a more than ordinary significance. In its details and general plan it has been greatly changed for the better, and that is saying a great deal for a work on so abstruse a subject, the excellence of which had already enabled it to pass through two editions. To no mathematical treatise in the English language can the epithet "lucid" be more fitly applied. It is also fully up to date, so that we might justly add to its title: "A Résumé of what Men Knew of the Equilibrium of Physical Forces at the Beginning of the Year 1886." It presupposes an acquaintance with the highest branches of pure mathematics, especially the calculus, and one chapter (chap. xiv, vol. ii) will be intelligible only to those who have some knowledge of Quaternions. For those who have not the necessary preparation and yet wish to acquire a knowledge of the more essential parts of the science of statics, a little treatise of 270 pages, 12mo, by John Greaves, Fellow and Mathematical Lecturer of Christ's College, Cambridge (Macmillan), is well suited. It is constructed with special reference to Prof. Minchin's great treatise.

The name of Peirce still holds a high place in the list of American mathematicians. The latest contribution of the family to mathematical science comes from Prof. B. O. Peirce of Harvard, and is entitled 'Elements of the Theory of the Newtonian Potential Function' (Ginn & Co.). It treats, much more fully than would be inferred from its title, of the mathematical theory of attraction. The Professor says in his preface: "Although I have used freely the notation of the calculus, I have assumed on the part of the reader only an elementary knowledge of its principles." An examination of the work leads us to infer that "elementary knowledge" means considerably more at Harvard than it does at most colleges. The last chapter of the book applies the theory of attraction to the subject of Electrostatics. Although brief, it forms a very good introduction to the mathematical theory of a subject the importance of which is daily increasing.

Those who desire "information relating to the practical details of a magnetic survey" from one having extensive theoretical knowledge and great practical experience, will find it in a 12mo of 90 pages, by Prof. Francis E. Nipper of Washington University, entitled 'Theory of Magnetic Measurements' (D. Van Nostrand).

'Euclid Revised,' by R. C. J. Nixon, is one of the Clarendon Press Series. The original 'Euclid' is much altered, and there are many additions

intended to illustrate modern methods. Some of these additions are very interesting, but, after all, the book has something of the appearance of patch-work. We presume Mr. Nixon did not avowedly write a treatise on geometry, because the English are so devoted to Euclid that the appearance of his name on the title-page seems indispensable to the success of such a treatise.

Mr. George Bruce Halsted, late Instructor in Post-Graduate Mathematics at Princeton and now Professor of Mathematics in the University of Texas, has published a treatise on the 'Elements of Geometry' (John Wiley & Son). In 1881, while at Princeton, Mr. Halsted published a treatise on mensuration, which was reviewed with some severity in the *Nation*. The defects pointed out as existing in that treatise appear in a somewhat milder form in the present one. Terms "new and strange," new and sometimes queer definitions of old terms, old truths uttered in new forms, and other peculiarities which we have no room to specify, give the book an air of awkwardness and clumsiness which will draw away the attention of readers from its real merits. To give a single example, how could any mathematician, with the least sense of scientific elegance and symmetry, read, without smiling aloud, the following definition of a straight line (p. 9)?

"A straight line is a line which pierces space evenly, so that a piece of space from along one side of it will fit any side of any other portion."

The material form of the book is equally awkward and clumsy. Its giant size would lead one who only looked at its outside to infer that it must be a most extensive and exhaustive treatise. It is really no longer than ordinary text-books of geometry. The paper is very heavy and rather coarse, so that, thick as it is, it only contains 366 pages. The margins at the top and bottom of the page are of extraordinary width; the front margin is rather narrow.

We would not have our readers infer that Mr. Halsted is lacking in knowledge of his subject, or that his book does not substantially contain all that is desirable in a treatise on elementary geometry. His treatise on mensuration, his articles in the *Journal of Mathematics*, and the present treatise on geometry, give evidence of wide reading, of enthusiasm in the science, and of many qualities necessary to a successful teacher.

Prof. G. A. Wentworth of Phillips Exeter Academy has added to his series of text-books one on the 'Elements of Analytic Geometry' (Ginn & Co.). It is a small book, but contains quite as much as the most earnest professor will be able, with any profit, to force a class to go over in the time usually allotted to the study in those colleges which make it obligatory on all undergraduates. Its most marked characteristic is the astonishing number of examples. The treatise extends to only 221 pages, 12mo, yet it requires 26 pages inserted at the end, to record the answers only.

Quite a different book is an 'Elementary Coordinate Geometry,' by William Benjamin Smith, Professor of Physics Missouri State University (Ginn & Co.). From the title we inferred that this was only another text-book on analytic geometry, added to the multitude which have appeared in the last few years, and probably neither much better nor much worse than the rest. The motto on the title-page, "Maximum reasoning, minimum reckoning," with its double alliteration and slightly pretentious savor, did not promise favorably. But the concluding clause of a sentence near the end of the preface arrested our attention; it was, "determinants have been used freely." That certainly indicated something out of the ordinary run. Turning to the "Introduction," we found it consisted entirely of an exposition of the nature and

most essential properties of determinants. It concludes as follows:

"Under the hands of English and Continental masters, the Theory of Determinants has been of late years built up to colossal size and applied to almost every branch of mathematics; in fact, it has become well-nigh indispensable to higher research. An excellent English work is Muir's 'Theory of Determinants'—"

an opinion of Mr. Muir's work expressed in these columns about three years ago. Further examination showed that this work contains not only all the matters usually treated of in text-books of analytic geometry, but many others usually found only in treatises intended for professors, or those aspiring to become professors, rather than for ordinary pupils. Neither is the work confined to plane geometry. It invades space, and launches the student well into the geometry of three dimensions. Of course an octavo of 280 pages can only launch one into deep water, but one who has mastered these few pages will be well equipped to read with comparatively little trouble the four great treatises of Salmon on Higher Algebra, Conic Sections, Higher Plane Curves, and Geometry of Three Dimensions.

The author's name, William Benjamin Smith, is entirely English. But many of the idioms, the style, the general cast of the whole book, are exceedingly German. If he is of American birth, he must have resided in Germany much longer than the time usually spent at a German university, where he has certainly been, for he is a Ph.D. of Göttingen; or he has studied the works of German mathematicians until he thinks in their forms. We should hesitate a little about recommending his book to beginners. Our present impression is that it is rather strong meat for them, and that they had best for a while be satisfied with a lighter diet.

Luigi Cremona, Professor of Mathematics in the University of Rome, is one of the most learned and accomplished mathematicians in Europe. We say "learned," because he appears to have read pretty much everything worth reading about mathematics, and "accomplished," because he has the faculty of expressing other men's ideas in a form which, for artistic beauty and symmetry, is far superior to their own. A work of his on 'Projective Geometry,' which appeared in Italian in 1872, has, at the suggestion of his friends Profs. Sylvester and Price of Oxford, been translated into English, with the assistance of the author, by Mr. Charles Leudesdorf, Fellow of Pembroke College, Oxford, and published in the best style of the Clarendon Press. The work may, for our purposes, be sufficiently described as the whole science of perspective. In his preface Prof. Cremona disclaims all pretensions to having produced anything new either in matter or methods. Everything in it, he says, is old; most of it very old; much of it to be found in remote antiquity, in Euclid and Apollonius and Pappus. He places as one of three mottoes at the beginning of his preface the words of Ovid, *Pont. iii, 9, 55*:

"Da veniam scriptis, quorum non gloria nobis
Causa, sed utilitas officiumque fuit."

Yet it is really an astonishing work. Its learning is simply enormous. It gathers up everything pertaining to the subject from all times and places and languages; and moulds the vast material into a finished, symmetrical, and beautiful whole. Nothing seems borrowed; one would think, if he himself did not tell us the contrary by his scrupulous fidelity in referring to his authorities, that it all came out of one head.

Prof. Cremona presupposes, on the part of students of his work, only so much knowledge of triangles and the circle as is possessed by every boy who has studied an ordinary text-book of geometry—that is all. But to master the book is

no easy task. It will require a long, determined strenuous effort. Most of the 252 figures printed in the text are complicated, many of them exceedingly so. The reasoning is not difficult; what is required, and what the book will cultivate, is power of conception. Any artist who could force himself to endure the labor of mastering the work would reap incalculable benefit. Whatever defects his works might afterwards have, they would not arise from want of knowledge of the relations of space and distance and form. But there is no royal road to the geometry of Cremona any more than to that of Euclid. The road to it is broad and smooth and open, but very steep.

The last book upon our table is, for the general reader of mathematical tastes and acquirements, the most interesting—provided he reads German: 'Die Lehre von den Kegelschnitten im Alterthum,' by Dr. H. G. Zeuthen, Professor of Mathematics in the University of Copenhagen (Kopenhagen: Andr. Fred. Höst & Sohn). We have only the first half of the volume, and defer any extended notice until we receive the remainder. But we can already say, from actual perusal, that few persons will read this first half without looking forward with pleasurable impatience to the appearance of the second. The title of the book is wholly inadequate to give a conception of its contents. It is by no means confined to the conic sections, but casts a flood of light over every part of the work of the ancient geometers. The first chapter, which shows in what way those wonderful men accomplished by geometrical methods many of the results obtained in modern times by means of algebra—how they had, in fact, a geometrical algebra and a regular system of rules for solving equations by the ruler and compasses—is a most admirable example of the attainment of new results in a department which was supposed to be exhausted. But all this we must leave for future consideration.

MAZZINI.

Delta Vita di Giuseppe Mazzini. Per Jessie W. Mario. Milan: E. Sansogno. 1886. Quarto, with illustrations.

Joseph Mazzini: His Life, Writings, and Political Principles. With an introduction by William Lloyd Garrison. Hurd & Houghton. 1872.

WHEN, in 1872, a Boston author edited the life of Mazzini from his own autobiography and political and literary writings originally published in England in six volumes by Mme. Venturi, née Ashurst, under Mazzini's own direction, we welcomed it as the most graphic and comprehensive history of Italy's great patriot and liberal reformer. The introduction, written in Mr. Garrison's most sympathetic vein, is so lucid, appreciative, and convincing, that nothing better can be said in illustration of Mazzini's brilliant talents, loftiness of mind, and aspirations for the freedom, not only of his own countrymen, but of mankind.

From his early youth Mazzini dedicated his life to the cause of the oppressed, and worked with the strong will of a martyr and the faith of a prophet for the fulfilment of his mission. It was the pitiful sight of the Lombard refugees who had conspired against Austria in 1820, begging in the streets of Genoa, that first awakened his mind to the miseries of Italy, when he was a mere boy of eleven. A few years after, he, with the brothers Ruffini—one of them the future author of 'Dr. Antonio'—and other fellow-students, began the clandestine work of republican propaganda by means of the secret society of "Young Italy," which, gradually spreading among the

people, achieved finally the liberty of the nation.

One of the most remarkable incidents in Mazzini's patriotic aspirations was the following. He had been exiled from Piedmont in 1830 for the part he had taken in the liberal movement of that year. A few months after, on the death of Charles Felix, Charles Albert, who had been a conspirator against Austria, ascended the throne. On this occasion, the hopes of the patriots reviving, Mazzini addressed a letter to him, and published it under his signature, in which he openly asked him to take the lead of the liberal Italians, and drive the Austrians, the Grand Dukes, the King of Naples, and the other despots from Italy, and crown himself her only king. The textual words were:

"There is a crown brighter and nobler than that of Piedmont—a crown that only awaits a man bold enough to conceive the idea of wearing it, resolute and determined enough to consecrate himself wholly to the realization of that idea, and virtuous enough not to dim its splendor with ignoble tyranny. Moreover, if you do not put yourself at the head of the struggle for Italian independence, you may retard, but cannot prevent, the fulfilment of the destiny of the Italian people. If you do not do this, others will; they will do it without you, against you.

"Sire, I have spoken to you the truth. The men of freedom await your answer in your deeds. Whatsoever that answer be, rest assured that posterity will either hail your name as that of the greatest of men or the last of Italian tyrants. Take your choice."

What Charles Albert's feelings were when he read this letter—for he did read it—we know not; but he must have been startled at the rash conception and the daring of this youth of twenty-two in the face of all-powerful Austria and the other six despotic rulers of Italy, who, if they could have suspected such ideas in the new King of Piedmont, would have crushed him in a fortnight. Accordingly, whatever his internal feelings or aspirations might have been, he had to stifle them for the time, and his Government had to condemn the author and publisher of such ideas inimical to Austria and the other rulers in Italy. It was but seventeen years after, in 1848, that this very King took up Mazzini's patriotic idea, placed himself at the head of the Italian Liberals against Austria, fought for Italian independence, and lost his crown in the attempt. But his son, Victor Emmanuel, following boldly that ideal conception, carried it to its goal in 1870.

Mazzini's genius showed its almost prophetic insight in that letter; for from that day, throughout a long and laborious life of conspiracies and revolutions, he sought to destroy that monarchy of Piedmont and all monarchies, and he failed; but finally his original idea of the King of Piedmont wearing the crown of independent and united Italy succeeded in spite of all and in spite of himself. To him, therefore, is due the glory of first conceiving the unity of Italy, for before him the best that her most patriotic sons dared to aspire to and hope for was a federation of the several rulers of Italy independent of Austria.

The new life of Mazzini published in Italy by Jessie White Mario is of a more popular character. Mme. Mario, widow of the late eminent republican patriot and disciple of Mazzini, Alberto Mario, has gathered in this work all the details of his long and laborious life. It was published in numbers and in a very cheap form for circulation among the people. Mme. Mario, idolizing her hero, enters into the smallest details of his private life, his hidden workings, the secret societies he instituted both in Italy and in Europe, his coming and going in disguise, his hair-breadth escapes, his failures and successes, his triumvirate of the Roman republic—in fact, all the republican movement from 1830 to 1870, during which period Mazzini played a most prominent part; so much so that he became a sort of a spectre haunt-