authorities on European lands is especially noticeable. We are aware that this is intentional on the part of the author, but we hardly think that he has been well advised. It is among the multitude of modern books of travel, for the most part indifferent or bad, that guidance would be most valuable.

H. J. MACKINDER.

OUR BOOK SHELF.

Chemistry and Heat. By R. G. Durrant, M.A., F.C.S. (London: Rivingtons, 1887.)

THIS little book is a collection of laws and definitions connected with chemistry and heat, intended more especially for the use of students preparing for examination in these subjects. It is to be regarded chiefly as a companion to more extensive treatises, and as a substitute for the extracts and notes which the average student would make for himself.

The various laws are stated very clearly, and the examples illustrating them have been happily chosen. The subject of heat is only considered in so far as it enters into chemical work. The laws relating to atomic weights are particularly well arranged, and zinc being taken as a typical element, a whole chapter is devoted to the method of estimating its atomic weight. A chapter is also devoted to the determination of vapour densities by the well-known methods of Dumas, Hofmann, and Victor Meyer, each being illustrated by a numerical example. In all cases the details of the calculations are gone through with great care.

At the end of the book is a table showing the characteristic tests for the more important metals and acids. This is not nearly up to the same standard as the earlier part of the book, but still it will be of service where expedition is of maximum importance. We are afraid, however, that the results obtained by analyses without separations would not always be perfectly trustworthy. We should have expected the author to be aware that separations are indispensable for most examinations in practical chemistry. Several specimens of analyses are given in detail.

We have no doubt that the book will prove a useful addition to the already large family of hand-books prepared for the use of the fortunate student of chemistry.

A. F.

On Overwork and Premature Mental Decay. By C. H. F. Routh, M.D., M.R.C.P. Fourth Edition. (London: Baillière, Tindall, and Cox.)

DR. ROUTH takes a very gloomy view of some of the characteristics of the present age. He holds that insanity and premature mental decay are decidedly on the increase, and this fact he attributes chiefly to overwork. Whether or not he is correct in his interpretation of the statistics relating to insanity, there can be no doubt that overwork is far too common in these days of excessive competition, and Dr. Routh has done good service by showing clearly in this little book the inevitable consequences of any severe and continuous strain upon the powers either of the mind or the body. As to remedies for the evil consequences of overwork, he offers many wise suggestions, and prudent readers will probably be all the more inclined to pay attention to his counsels when they find that he lays stress mainly upon the necessity for periods of rest, for the cultivation of a variety of intellectual interests, and for rigid self-control. Dr. Routh has added to the value of his work by discussing in the present edition the effects of overwork upon women and young persons.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

Hall and Knight's "Higher Algebra."

IN your issue of September 1 (p. 409), there appeared a review of our "Higher Algebra," bearing the signature "R. B. H." The work under consideration is a sequel to an elementary text-book, as the title-page asserts; it does not profess to be anything more, and we should have thought that any reader would have recognized that "Higher" and "Elementary" are merely used as relative terms. This point has been practically ignored by your reviewer, and in consequence his remarks contain certain inaccuracies and misconceptions likely to leave a false impression on the mind of the reader.

In the first place, "R. B. H." complains that we postpone to our thirty-fourth chapter the discussion of the fundamental laws of algebra, the "remainder theorem," symmetrical expressions, and identities. As a matter of fact, these things do not appear here "for the first time;" propositions scattered over the "Elementary Algebra" are here summarized, and in some cases rediscussed; and, with regard to the "remainder theorem," its proof and easy applications are to be found in the twenty-ninth chapter of the elementary work—a chapter which also contains a section on identities and transformations, especially those which can be treated cyclically. Hence, in criticising the miscellaneous chapter of the more advanced work, it should be remembered that for the most part it merely extends and develops what has elsewhere already been treated far more comprehensively than is usual in an Elementary Algebra.

In the chapter on "Miscellaneous Equations," we are told that "there is no hint or caution given that the root obtained may not satisfy the original equation unless the sign of one or more of the radicals involved in it is changed," and our attention is called to an example on p. 99. Surely "R. B. H." must have read this page somewhat carelessly, for at the head of it there stands a remark containing the required hint, while reference is made to a note in the "Elementary Algebra," in which the point is fully discussed.

The remarks on our chapter on permutations and combinations are somewhat vague and indefinite, and we do not gather which proofs are held to be "very difficult to understand." We have used the methods of this chapter very successfully with boys of ordinary intelligence for twelve years or more, and we have always found the proofs contained in Arts. 141, 152, 153, and 156 far more intelligible than those given in other text-books. The illustration given by "R. B. H." may be useful enough for blackboard work, and it is hardly conceivable that any teacher of experience would attempt to handle this part of algebra without a frequent and ready use of such exemplification; but we fail to see how a *proof* of the general formula for the number of permutations of n things *together* could be framed on these lines in a form suitable for a text-book.

To the other points raised by your reviewer we do not reply because they are mostly matters of opinion, and whether we have been judicious in our arrangement and subdivision of the subject is a question which can only be decided by the experience of teachers using our books. But we may perhaps remark that the obvious necessities of a school text-book should not be overlooked. In its present form our "Elementary Algebra" contains upwards of 360 pages, and if we had included all the sections now suggested by "R. B. H." the book would have been increased by 150 pages or more, and would have been practically useless, for it would have been published at a price quite prohibitive for school use.

Our two books have been designed to form one complete treatise, and we venture to think that anyone who will fairly criticise the work as a whole will not find the glaring omissions and "defect of plan" suggested by your reviewer.

H. S. HALL.
S. R. KNIGHT.

PERMIT me to remark that far from "ignoring" Messrs. Hall and Knight's use of the terms "Elementary" and "Higher" for the two parts of their Algebra, I have called special attention to it. It seems to me that the term "Higher Algebra" (*algèbre supérieure*) having been employed by Serret as embracing "the algebraic resolution of equations" in general, and that of "Modern Higher Algebra" by Salmon for what "with greater precision might be called the Algebra of Linear Transformations," it is hardly open to the writers of what is really a text-book of elementary algebra in two parts to apply the same term to the second part of their work, and to object to a gentle protest from a reviewer. I am at a loss to see where in my subsequent remarks I have practically ignored their own use of the terms.

I observed that "the fundamental laws of algebra are for the first time gathered together and discussed in the thirty-fourth chapter." This implies that they have appeared *dispersedly* in the book before, but the references in this chapter hardly justify the contention that they have appeared as "the fundamental laws." In fact, the distinctive law of ordinary algebra that $ab = ba$, instead of being emphasized, is introduced as a fact "with which the student is familiar in arithmetic" ("Elementary Algebra," Art. 13), and nothing more said, as perhaps at this early stage might be expected. So again the "remainder theorem" does in fact appear in an article, *marked with an asterisk*, at the end of a chapter of "Miscellaneous Theorems" in the "Elementary Algebra," but only as an isolated proposition with a few exemplifications of its use. The point of my remark was that I should have expected such a fundamental theorem to be put in the forefront and largely made use of in the chapter on "Harder Factors." I would suggest this for the consideration of the authors in a future edition.

In like manner, as to my remark on the roots of equations involving radicals, the caution, which I regret that I overlooked in p. 99, appears only as a remark on one particular example, while nothing is said about it in the next, to which it is equally applicable, and in the answers at the end I find roots given which do not satisfy the equations as they stand. It is the practice of not requiring the pupil to select the signs suitable to each root, which I regretted to find that our authors in this way sanction.

Regard for your space prevents my adding more than the single remark that I regret that the practical commercial consideration of the cost of the first part of the book should have necessitated what I have regarded, and what, by urging this plea, the authors seem almost to admit, as, in itself, a "defect of plan." On reconsidering the matter for a future edition, the authors will, I cannot help thinking, find it possible, as it is desirable, to transfer so much from the second to the first part as will make the latter sufficient by itself, as at present it hardly is, for many pupils who need only a small portion of their higher part.

R. B. H.

On the Constant P in Observations of Terrestrial Magnetism.

HAVING been absent from town, I have to-day for the first time seen the letters of Prof. Harkness and Mr. Ellis on the calculation of P.

Though unaware that it was used at Greenwich, or elsewhere, Dr. Thorpe and I have, for a year at least, employed the formula given by Mr. Ellis in the reduction of observations made for the magnetic survey. We have, in fact, made it still more accurate by the addition of another term. Thus, if we write l and l_1 for $\log A$ and $\log A_1$, and μ for the modulus, it may easily be shown that—

$$P = \frac{r_1^2 r^2}{r_1^2 - r^2} \times \frac{l - l_1}{\mu} - \frac{r_1^2 r^2 (r_1^2 + r^2)}{2(r_1^2 - r^2)^2} \left(\frac{l - l_1}{\mu} \right)^2 \text{ nearly.}$$

Using the metric system of units and taking as is usual $r = 0.3$, $r_1 = 0.4$, this becomes—

$$P = 0.4737 (l - l_1) - 1.947 (l - l_1)^2.$$

The value of P for our first year's work calculated by the ordinary method is '000817. Deduced from the formula given by Mr. Ellis it is '000824, which the second term given above reduces to '000818.

In this case the effect of the correction on the value of H is considerably below the error of experiment, but as attention has been drawn to the matter, it may be as well to point out that by

means of the second term the accuracy of the approximation can be readily tested without the trouble of calculating P directly.

ARTHUR W. RÜCKER.

September 21.

A Meteor's Flash and Explosion.

AT 8.52 p.m. (Dublin time) of yesterday, Tuesday, September 13, my wife and I while walking home were startled by a sudden bright flash like lightning, but slower and more regular in its movement. Simultaneously an intensely brilliant meteor shot majestically across the sky from north-north-west towards south-south-east, passing near, but to the eastward of, the zenith in its route. It seemed to take its origin from between the Pointers and the constellation Perseus, and died out at a height of 25° or 30° above the horizon.

Precisely three minutes and a half later a dull report was heard, which resembled that of a very distant field-gun, or of a peal of thunder far away, but it did not reverberate as thunder would have done.

It was impossible not to connect the phenomena of the flash and the report with each other. I accordingly made a rough calculation, which gave 43.4 miles as the distance—not necessarily vertical, but absolute—at which the meteor had become incandescent, and exploded, as a result of its collision with the earth's atmosphere.

JOHN WILLIAM MOORE.

40 Fitzwilliam Square West, Dublin, September 14.

A Monstrous Foxglove.

MR. TENNANT in NATURE of September 22 (p. 482), after describing a curiously abnormal specimen of *Digitalis purpurea*, writes to ask if "such monstrous forms are at all usual." Thinking your correspondent may be unacquainted with Mr. Herbert Spencer's "Principles of Biology," I write to draw his attention to p. 226, vol. i. of that work, where, in speaking of some foxgloves growing in Derbyshire, Mr. Spencer says of one:—

"The following are the notes I took of its structure:—First or lowest flower on the stem, very large; calyx containing eight divisions, one partly transformed into a corolla, and another transformed into a small bud with bract (this bud consisted of a five-cleft calyx, four sessile anthers, a pistil, and a rudimentary corolla); the corolla of the main flower, which was complete, contained six stamens, three of them bearing anthers, two others being flattened and coloured, and one rudimentary; there was no pistil, but, *in place of it*, a large bud, consisting of a three-cleft calyx, of which two divisions were tinted at the ends, an imperfect corolla, marked internally with the usual purple spots and hairs, three anthers sessile on this mal-formed corolla, a pistil, a seed-vessel with ovules, and, growing to it, another bud of which the structure was indistinct. Second flower, large; calyx of seven divisions, one being transformed into a bud with bract, but much smaller than the other; corolla large, but cleft along the top; six stamens with anthers, pistil, and seed-vessel. Third flower, large; six-cleft calyx, cleft corolla, with six stamens, pistil, and seed-vessel, with a second pistil half unfolded at its apex. Fourth flower, large; divided along the top, six stamens. Fifth flower, large; corolla divided into three parts, six stamens. Sixth flower, large; corolla cleft, calyx six-cleft, the rest of the flower normal. Seventh and all succeeding flowers normal."

F. HOWARD COLLINS.

Churchfield, Edgbaston.

THE "UMBRIA'S" WAVE.

I HAVE been instructed by the Meteorological Council to send you the following report of the *Umbria's* wave from Capt. Watson, F.R.Met.Soc., who is General Superintendent of the Cunard Line of steamers.

HENRY TOYNBEE,
Marine Superintendent.

Meteorological Office, September 18.

MY DEAR CAPT. TOYNBEE,—I send you all the particulars I can get regarding the so-called "big wave" that struck the *Umbria*. No doubt there were some big waves knocking about the Atlantic on the morning of