which a true impressionism can alone be based, have found and do find the study of anatomy a help in their work.

That such knowledge may be abused is not surprising; the example of the unfortunate Haydon might serve as a warning. Yet there are plenty of instances in modern work in which this knowledge is duly restrained. Leighton had a keen appreciation of anatomical detail, and his bronze of an Athlete struggling with a python is likely to outlive most, if not all, his pictorial efforts as a work of art.

Books on so-called artistic anatomy, written usually by surgeons and anatomists having little or no knowledge of the requirements of artists, have, as a rule, been prepared by "boiling down" the technical treatises supplied to medical students. It is to Dr. Paul Richer that we are indebted for having dealt with the subject in an appreciative spirit; he approaches it, not merely from the standpoint of the anatomist, but from that of the artist as well. His method is to represent the figure in action in different poses, and submit a chart explanatory of the various structures on which the surface contours depend, having first, of course, supplied his readers with such information regarding the bones and muscles as is necessary to enable them to understand and appreciate the diagrams. It would be difficult to over-estimate the value of his book; its cost, however, places it beyond the reach of most students.

When an art-master produces an atlas of anatomical diagrams, we naturally expect to have fresh light thrown on the subject, together with a keener appreciation of the requirements of art students. We are not inclined to be too exacting with regard to the anatomical details if only we can get some further insight into their application to the study of the human figure.

In an interesting introduction to the present volume, Prof. Cleland, whose artistic sympathies are well known, makes use of the statement that the work occupies "ground which has not hitherto been taken up." With this opinion we cannot agree; for, as a matter of fact, the bulk of the illustrations in this atlas are reproductions, somewhat diagrammatically treated, of tracings or combined tracings of Richer's drawings. To these the author has had no hesitation in affixing his name without, so far as we can ascertain, once mentioning the source from which his figures are derived. The only features in the book which display any originality are the plates in which those parts of the skeleton having a direct relation to the surface contours are blocked in in distinctive colours. The absence of explanatory text, as well as the lack of reference to the contours of the figure in action, seem to us to minimise its value as a text-book to be placed in the hands of students. As diagrammatic reproductions of Richer's figures, the plates in this atlas may not be without value. We confess, however, to a preference for the originals.

Chemistry for Continuation Schools. By R. L. Taylor. Pp. 52. (Manchester: Thomas Wyatt, 1899.)

THIS little book, like many others which have appeared during the past few years, should assist the progress of rational methods of teaching elementary chemistry. It consists of a series of nearly a hundred simple experiments to be performed by or for pupils commencing the study of chemistry. The subjects illustrated by the experiments are elements and compounds, chemistry of the air, water, acids and alkalis, carbon and carbon dioxide. Pupils who perform the experiments will obtain a sound knowledge of the nature of chemical changes, and of the properties of some common substances.

Fig. 3, illustrating the preparation and collection of oxygen from potassium chlorate and manganese dioxide, shows a liquid in the flask instead of the oxygen mixture.

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 intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Blue Ray[1] of Sunrise over Mont Blanc.

LOOKING out at 5 o'clock this morning from a balcony of this hotel, 1545 metres above sea-level, and about 68 kilometres W. 18° S. from Mont Blanc, I had a magnificent view of Alpine ranges of Switzerland, Savoy, and Dauphiné; perfectly clear and sharp on the morning twilight sky. This promised me an opportunity for which I had been waiting five or six years; to see the earliest instantaneous light through very clear air, and find whether it was perceptibly blue. I therefore resolved to watch an hour till sunrise, and was amply rewarded by all the splendours I saw. Having only vague knowledge of the orientation of the hotel, I could not at first judge whereabouts the sun would rise; but in the course of half an hour rosy tints on each side of the place of strongest twilight showed me that it would be visible from the balcony; and I was helped to this conclusion by Haidinger's brushes when the illumination of the air at greater altitudes by a brilliant half-moon nearly overhead, was overpowered by sunlight streaming upwards from beyond the mountains. A little later, beams of sunlight and shadows of distant mountains converged clearly to a point deep under the very summit of Mont Blanc. In the course of five or ten minutes I was able to watch the point of convergence travelling obliquely upwards till in an instant I saw a blue light against the sky on the southern profile of Mont Blanc; which, in less than the one-twentieth of a second became dazzlingly white, like a brilliant electric arc-light. I had no dark glass at hand, so I could not any longer watch the rising sun.

KELVIN.

Hotel du Mont-Revard, above Aix-les-Bains,
August 27.

A Fold-Making Apparatus for Lecture Purposes.

I HAVE found the piece of apparatus which I am about to describe so effective for lecture experiments, that I venture to think that others engaged in geological teaching may be glad to possess details as to its construction and mode of operation.

The machine (Fig. 1) consists of two parallel wooden rollers, about 3 feet apart. Each is about 12 inches long and 4 inches

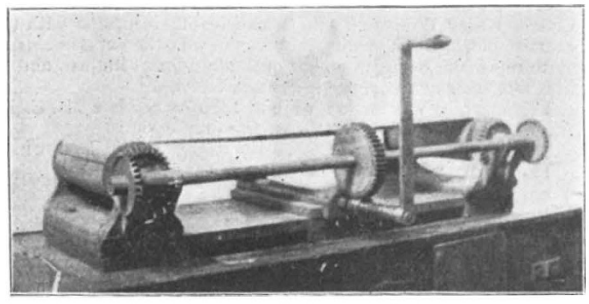

FIG. 1.

in diameter. A shaft at right angles to their length turns the two rollers in opposite directions by means of toothed bevel wheels, the shaft itself being driven by a worm wheel and worm, the latter being actuated directly by the handle. One turn of the handle only causes $\frac{1}{48}$ turn of the shaft and rollers, so that a very slow motion can be imparted to the latter. A sheet of

[1] The "Rayon Vert" of Jules Verne is the corresponding phenomenon at sunset; which I first saw about six years ago.

india-rubber about $\frac{1}{8}$-inch thick, firmly attached by a slot and screwed bar to each roller, completes the arrangement.

The rollers being wound through about one entire revolution, and the india-rubber being thus stretched tight, layers of cloth, clay, paste or other giving material, are laid upon it. The handle is then turned in the reverse direction, and the india-rubber gradually released. Folds are in this way shown slowly growing—the broad elastic band simulating the contraction of a portion of the earth's crust. In Figs. 2 and 3, cloths are seen

FIG. 2.

FIG 3.

folded thus—first, without superincumbent weight, and second, with a weight of 30 lbs.

That the larger folds are those generated at the surface, and the smaller and more numerous those produced under pressure (*i.e.* at great depths), is here made evident.

By substituting blocks of stone or wood for ordinary weights above the cloths (Fig. 4) and repeating the experiment, some of the relations between folding and faulting are clearly shown.

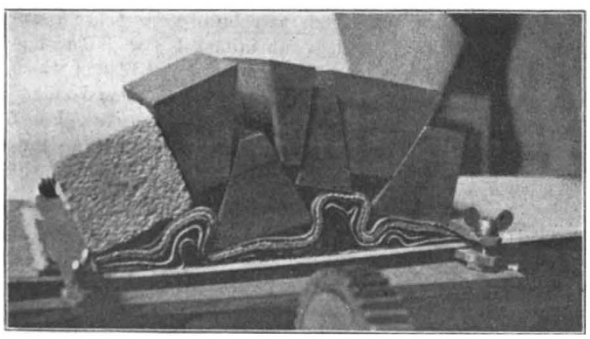

FIG. 4.

If clay be used instead of cloths, all the results of Favre's well-known experiments (*Arch. d. Sciences Phys. et Nat.*, 1878, and also NATURE), and many of those described by Cadell, Bailey Willis and others, can be obtained, and with the exercise of a little ingenuity it is easy to vary the experiments so as to reproduce a large number of the fold-forms known, and to illustrate their consequences—thrusts, faults, &c.

This machine was made for me in 1880 by the late Mr. C. D. Austen, of Newcastle-upon-Tyne, from my designs.

G. A. LEBOUR.

The Durham College of Science, Newcastle-upon-Tyne, August 18.

Scoring at Rifle Matches.

IN his letter to NATURE of August 17, Mr. Mallock appears to assume that there is such a thing as abstract "accuracy" in estimating the value of a marksman's score. The method in use at Bisley is, as I understand him, to be regarded as a rough approximation to the accurate method, whether the best available approximation or not. Is it not rather the case that the standard of accuracy is itself arbitrary, and what the authorities at Bisley have established is not an approximation to an ideal standard, but is to be regarded as a real standard of excellence?

In result Mr. Mallock's "accurate" method is this: in his notation any two scores for which $R^2+\rho^2$ is the same are of equal merit, or that one for which $R^2+\rho^2$ has the least value is the best score. Now, if "a" be the distance of any shot mark from the bull's-eye, n the number of shots, $R^2+\rho^2=\Sigma a^2/n$. Mr. Mallock's standard, then, is that the best score is that for which the sum of the squares of the distances from the bull's-eye is minimum. I see no reason why this method should be regarded as accurate *par excellence*, except the analogy of the method of least squares. But the analogy is misleading.

Where the method of least squares is applicable, the object is to find the most advantageous value of an unknown quantity to be deduced from a number of observations. An accurate value of the quantity does exist. And of two or more results deduced from the observations, that which is nearer to the accurate value is always better than one more remote, however near to the truth either may be.

In rifle shooting, on the other hand, there is generally some finite space—*e.g.* the port-hole of an enemy's ironclad, such that all shots which pass through it are of practically equal value, and all shots which do not pass through it are of little or no value.

This is much more accurately represented by the Bisley method than by the method which Mr. Mallock would substitute for it.

S. H. BURBURY.

THE only remark I should wish to make on Mr. Burbury's letter is that every shot on the target is truly the record of an observation, and that there is every reason to treat these records as far as is practicable by the methods which apply in obtaining the best means of a number of observations. Of course, it is only in the case of "centre of target" competitions the "$R^2+\rho^2$ a minimum" test applies. Prizes might well be given for close grouping, with a penalty depending on the mean distance of the group from the centre of the target.

August 22. A. MALLOCK.

Spectrum Series.

SIR NORMAN LOCKYER'S lectures on "Spectrum Series" seem to show very clearly the important fact that there is a close connection between the valency of an element and the lines in its spectrum.

The connection indicated is as follows:—

Nonvalent elements yield spectra with single lines.

Monovalents yield doubles.

Divalents yield triplets.

On turning to the list given in NATURE (vol. lx. p. 370), it will be seen that helium, by yielding doubles as well as singles, and cobalt, by yielding doubles only, are practically the only discordant cases in Sir Norman Lockyer's list, since aluminium and indium are trivalents, and their anomalous behaviour in yielding doubles only can perhaps be explained.

August 26. W. SEDGWICK.

Magnetic "Lines of Force."

IN some text-books and by some lecturers (*e.g.* Prof. A. Gray, as reported in NATURE of August 17, p. 379), the lines of magnetic force are said to be the curves along which iron filings are marshalled when sifted over a piece of card laid over a horizontally placed magnet.

Surely this is hardly correct. The true lines of magnetic force must be represented, like those of all other radiant forces, by radiating straight lines drawn through the points of action of the resultants of all the forces residing in the individual molecules of a given magnet (such points, though varying in position with the position of a magnetic body in the field, being often referred to as fixed "poles").

The symmetrical figures traced out by iron filings merely show, of course, the directions in which a line joining the poles of a very short magnet will lie in different parts of a magnetic field, under the influence of the true lines of force.

E. R. P.

August 29.

Critical Pressure.—A Suggested New Definition.

THE critical pressure of a substance is commonly defined as "the least pressure that will suffice to reduce that substance from the gaseous to the liquid state when at its critical temperature." But this definition contemplates the matter solely from the stand point of what occurs at the critical temperature, and I think it