

without this." Some time ago the present writer honestly endeavoured to understand Mr. Lunn's "Philosophy of Voice," and utterly failed in his attempts. He cannot find any assistance towards understanding it in the present little tract (pp. 88) of loose writing, wonderful reasoning, and jumping exposition. Let us hope that Mr. Lunn's teaching is better than his preaching. His axioms are however rather startling, especially the second (p. 7), "All voices are naturally beautiful. All ugliness in vocal tone is the result of transferred habits acquired by the artificial use of voice in speech." If this use is "artificial," what use is "natural"? But attempts to understand and criticism are all thrown away. Notwithstanding Mr. Lunn's initial confession that he is a mere follower of Galen, he declares in his introduction (p. 1): "It is a *fait accompli*. I have founded a New Profession standing midway between the Musical and the Medical worlds, with Art on its one side, Science on the other; firm and irrefutable." In this state of suspension, like Mahomet's coffin, "midway between" two "worlds," and belonging to neither Science nor Art, which seems fitly to describe the nature of the book, we are content to leave it to the happy conviction of the author that what he says (of course when others can find out what it is) is "firm and irrefutable."

Practical Plane Geometry and Projection for Science Classes, Schools, and Colleges. By Henry Angel. Vol. I., Text; Vol. II., Plates. Collins's Advanced Science Series. (London and Glasgow, 1880.)

A VERY practical and useful book by an experienced teacher: it is designed to meet the requirements of students at the Royal School of Mines, at the Royal Military Academy, at Cooper's Hill, and elsewhere, and embraces great part of the two higher stages of the Science and Art Department syllabus. There is no great scope for absolute novelty in such a work, and our author acknowledges his indebtedness to the works of many, if not most, of his well-known predecessors, but the arrangement appears to be judicious, and the constructions good and clearly enunciated. In the *Practical Geometry* (six chapters) the student is taught the use and construction of scales, of triangles and polygons, and there are numerous problems on areas, on circles in contact, and on other plane curves with their tangents and normals. The orthographical portion treats of the projection of the five regular solids, of other simple solids, of flat and curved surfaces, intersected by cutting planes, and of solids inscribed in, or circumscribed to, the surfaces of other solids; of the interpenetration of solids, of the projection of shadows, on isometric projection, on the solution of the spherical triangle, and on horizontal projection—a very extensive and varied bill of fare. In addition there are numerous questions for practice, many of which are taken from examination papers, and the text is illustrated by several clearly-drawn figures. Part ii. contains eighty-one large-page plates to further illustrate the constructions. The two parts together ought to enable any painstaking student to take a creditable place in his examination and to acquire a solid acquaintance with the subject.

Teorica delle Forze Newtoniane e sui applicazioni all' Elettrostatica e al Magnetismo del Prof. Enrico Betti. 365 pp. (Pisa, 1879.)

In the session 1863-64 Prof. Betti delivered at Pisa a course of lectures, subsequently (1865) printed in the *Nuovo Cimento* under the title "La Teorica delle Forze che agiscono secondo la legge di Newton e sua applicazione alla elettricità statica"; the volume before us is what may be looked upon as its greatly enlarged second edition. It consists of an introduction and three chapters. The first chapter, in twenty-three sections, treats of Potential Functions and of Potentials (§ 11 gives Green's

theorem and some others due to Gauss; § 12 Stokes's theorem for transforming a double integral into a simple integral, and the properties of a surface which has on one face a stratum of attracting, and on the opposite face an equal stratum of repulsive, matter; the other sections appear to contain nearly all the known properties of these functions). Chapter II., on Electrostatics, in sixteen sections, discusses several cases of electrostatical distribution, the method of images (Sir W. Thomson's theory) and condensers; Chapter III., on Magnetism, is divided into ten sections (on p. 304 Prof. Betti announces the theorem, "Se la superficie di un corpo è semplicemente connessa ed ha un numero finito di poli, questo numero sarà sempre pari," an advance upon Gauss, who has shown that if there be three poles there must also be a fourth).

Kalkül der Abzählenden Geometrie. Von Dr. Hermann Schubert. (Leipzig: Teubner, 1879.)

DR. SCHUBERT in this work gives us, in the form of a treatise of 359 pages, the principal results as yet arrived at in the "Numerical Geometry," a branch of mathematics originated by M. Chasles and subsequently studied by Zeuthen, Sturm, Halphen, Klein, and in this country by Dr. Hirst ("On the Correlation of Two Planes," vol. v.; "Correlation in Space," vol. vi.; "Note on the Correlation of Two Planes," vol. viii.; London Math. Soc. *Proceedings*). The book closes with a full historical and bibliographical list in the form of notes to the several chapters.

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 ensure the appearance even of communications containing interesting and novel facts.]

The Spectrum of Hartwig's Comet

THE spectrum of this comet was examined here on the evening of October 7 with a spectroscope having a single prism of 45°, and was found to consist of three bright bands and a continuous spectrum corresponding to the nucleus. The middle and brightest band was compared with the band at W.L. 5198 in the spectrum of a vacuum tube containing alcohol vapour, and three micrometer measures gave the position of the less refrangible edge of the comet band at W.L. 5184, 5215, and 5204 tenth metres respectively. The breadth of the band was about 40 tenth metres. These measures would indicate that the principal comet-band is coincident with the band at W.L. 5198 of the vacuum-tube spectrum of carbon-compounds, and not with that of the Bunsen-flame at W.L. 5165. The observations however were made under unfavourable circumstances, the comet being low, and involved in haze and cloud. The positions of the other two bands were not determined. W. H. M. CHRISTIE

Royal Observatory, Greenwich, October 11

Wire Torsion

I HOPE you will allow me to seek information, through your aid, on a subject which is perplexing me a good deal at present. I am engaged in studying a gravimeter designed by the late J. Allan Broun, in which gravity is balanced by the torsion of a single wire; or is intended to be so. As the function of the instrument depends largely on the law of torsion in wires, I have been making experiments to satisfy myself on some points. It is in the results of one of these that I have met with my difficulty. I was using thin brass wire (diam .02), and after stretching it till it broke, twice, I supposed it to be at or near its maximum elasticity, and proceeded to use it in the intended way. At each end of a 6-foot plank I inserted into the edge a 2-inch screw. The wire was fastened upon these so as to get a strain by turning them. The wire was in two pieces, attached to opposite sides of a ring in the middle. By turning this ring the two wires were