year by year, and also the greater tendency towards accurate results, call for a book containing all the various rules and tables relating to those parts of mathematical and mechanical science whose application most frequently occurs in the useful arts, and especially in engineering and practical mechanics. In this volume of moderate bulk, such a work has been provided. The use of algebraical symbols has been avoided as much as possible, excepting in those cases in which the rules cannot be clearly expressed without them.

The book is divided into ten parts. The first deals with arithmetic and mensuration, including tables of cubes, squares, logarithms, a summary of the rules in trigonometry, with tables of arcs, sines, &c., concluding with the measurement of areas of surfaces, volumes of solids, and lengths of curves, &c. Part 2 treats of the measures of different nations, with tables and rules relating not only to measures of angles, time, length, surface, &c., but to those of speed, heaviness, pressure, work power, &c. Engineering geodesy, distributive forces and mechanical centres, balance and stability of structures, and strength of materials are included in the next four parts. Part 7 relates to machines in general, and gives rules for the comparison of the motions of different parts of a machine, and for the designing of teeth of wheels, speed cones, &c., with rules relating to work at uniform and variable speed. Parts 8 and 9 treat of hydraulics and heat, together with the steam-engine. The former includes rules for flow of water, prime movers, propulsion of vessels, &c.; the latter consists of tables of elasticity, volume, and specific heat of gases, factors of evaporation, with rules relating to furnaces, boilers, expenditure of heat in cylinders, efficiency of strain, &c.

Part 10, written by Andrew Jamieson, has been revised and considerably extended, and consists of electrical rules, tables, and formulæ. The information has been brought up to date as much as possible, and many points of difficulty, such as directions of currents, magnetic force and motion, are made clear by means of illustrations. Electrical engineering symbols and units of measurement, heat, and light are first given. These are followed by various forms of Wheatstone bridges, apparatus for testing electric light cables, the wire-testing batteries on the General Post Office system, tables of resistance, general data of the different submarine cables and batteries.

In the appendix there is a useful diagram of the mechanical properties of steam, showing the absolute pressure in pounds per square inch, and volumes in cubic feet per pound of dry saturated steam, and the mean absolute pressure, in decimal parts of absolute pressure of admission. A complete index adds greatly to the value of the work; and we may say that the more one looks through the pages of the book the more one is struck by the large amount of useful information collected together in these 456 pages.

Colour. By C. T. Whitmell. (Cardiff: Wm. Lewis, 1888.)

THIS book is designed for the general reader, and is, on the whole, well suited to this class of person. The principal drawback it possesses is unquestionably the want of a good index, while the division into short numbered sections of in many cases a few lines only is very inconvenient, and produces a sensation of discontinuity of subject. Some parts are excellently done, notably the illustrations given of irregular reflection by turbid media, the description of colour produced by absorption, and the part dealing with colour-blindness. In connection with this last subject much extension of our knowledge would no doubt result from systematic observation of the progressive development of colour-blindness in cases of locomotor ataxy.

It is to be regretted that the author did not supply coloured diagrams to at least some of the sections, or failing this it would be more suggestive in the diagrams of light transmitted through different specimens of coloured glass to shade the part representing the absorbed and to leave unshaded that representing the transmitted light. Some preliminary description of the optical apparatus employed would be also serviceable, *e.g.* in section 10 the reader is told the properties of a spectrum produced by a diffraction grating, no reference being made until much later, and then a very incomplete one, as to the principle involved in the formation of the spectrum.

The book is fairly up to date, containing as it does reference to Langley's bolometric observations and to König's researches on the theory of colour vision. Interesting cases are given of errors due to ignorance of scientific principles; and in view of the frequency of their occurrence—perhaps more noticeably from neglect of the effects of refraction than of the principles of colour—it is regrettable that manuals such as Church's, Rood's, or this, are not more generally read by painters.

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.*]

Sailing Flight of Large Birds over Land.

IT gave me great pleasure to see, by Lord Rayleigh's letter in NATURE of May 9 (p. 34), that the remarks made by me some months ago on this subject were not made in vain.

Ever since 1863, the sailing flight of large birds (which is here very common) has been a subject of observation to me, and odd notes have been sent home to the *English Mechanic* and to the Aëronautical Society (see Sixteenth Report, 1881, pp. 10-17).

Mr. A. Baines, in NATURE of May 2 (p. 9), well describes the sustained sailing of the albatross, indicating what I take to be the *vera causa*, *i.e.* the rising, kite-like, when it sweeps round to meet the wind, the energy of motion being gained by descending *with it* along an incline. But this problem, as seen among the sea-birds, seems to be complicated by the possibility of lifting action due to the waves; and, in Mr. Baines's letter, by different velocities of the air near the sea surface and at elevations of 20 feet or so. Out here, these two features are not only eliminated, but we see the bird doing more work.

The sea-birds merely sustain for hours a given weight, say twenty pounds, without flapping the wings, whereas the land-birds lift this twenty pounds, in two or three hours, to a height of 1 or 2 miles vertically, as well.

The adjutants (*Leptotilus argala* and *nudifrons*), the cyrus, pelican, vultures of several kinds, and storks, habitually rise here during fine weather, if there is a wind. At first they rise by flapping the wings vigorously, and, when 200 or 300 feet up, gradually begin to sail in huge right- or left-hand spirals, rising 30 or 40 feet at each lap. When seen thus, the wings are rigidly extended, and tail spread, the primary wing-feathers distinctly separated, and a loud musical tone is heard as the bird sweeps round and round overhead. If low down, they can be closely studied through a binocular, but if at a great height, I generally use a telescope, 3″·5 O.G., and terrestrial eye-piece, power 40. With this latter I can follow them, either in a group or singly, until each is a mere speck, and the elevation can be fairly calculated, when the spread of wing is often 8 or 9 feet × 1½.

Our prevailing north-east wind, and also our south-west monsoon, are particularly steady air-drifts of, say, 5 or 6 to 10 miles per hour, and I should doubt very much, if, after 500 feet up, there is any variation in the speed at different heights. The lifting due to occasional waves should also here be out of the question, and under these conditions I would ask Lord Rayleigh where we could possibly obtain the "energy of position" if it is not from the kite-like action? In my former note, to which he refers, I think a small diagram illustrated the slow drift to leeward as the bird rose by sailing in spirals.