problems and exercises are likewise provided. The style of the author is attractive, and the course as a whole has great educational value; in fact, we know of no text-book which presents the subject in a way more suited to the natural capacities of the youthful reader, or which is better adapted to impart a thorough knowledge of concrete geometry, and at the same time to develop the reasoning faculties in a legitimate manner.

There is a chapter describing the vernier, spherometer, callipers, and the micrometer screw gauge, and also treating briefly of the mensuration of the simpler geometrical solids. There are selections of recent examination papers, four-figure logarithms and trigonometrical ratios, answers to numerical problems, and a very useful general index.

If a draughtsman were to criticise the book he would probably say that in measuring and setting off lengths the scale should be directly applied without the intervention of dividers; that a line to be accurately measured should have its ends clearly defined by short cross-lines; and that diagonal scales, being of little or no practical use, are made rather too much of in the chapter devoted to them. But these are very minor matters, and do not detract from the general excellence of the work. We know of no text-book of elementary geometry which can be more confidently recommended to teachers, and none from which students are likely to derive more profit.

*Les Procédés de Commande à Distance au Moyen de l'Électricité.* By Captain Régis Frilley. Pp. vii+190. (Paris: Gauthier-Villars, 1906.) Price 3.50 francs.

THE problem considered in this volume is that of communicating to a distant mechanism a movement the magnitude, direction, and sense of which are definite functions of those of a transmitting mechanism. The character of the movements which it is desired to transmit varies very much in degree from the simplest of all (traction), in which the three "commands"—*forwards, backwards, stop*—are alone the orders to be obeyed. The author classifies the different mechanisms employed, not according to their complication, but according to the methods that are characteristic of them. These form seven groups—(1) direct action apparatus, (2) apparatus using relays, (3) apparatus employing rotating fields, (4) Wheatstone's bridge devices, (5) apparatus based on the use of induction sparks, (6) escapements, (7) Hertzian waves. The various devices that have been used from time to time are very clearly described under these headings with the aid of diagrams. In chapter viii. an account is given of the commutating device of Lieutenant-Colonel Rivals, by which the sending and receiving instruments can be used as either in turn. Altogether the book forms a very useful and suggestive summary of this very important branch of modern military practice.

*Das Radium und die radioactiven Stoffe.* By Karl Frhr. von Papius. Pp. viii+90. (Berlin: Gustav Schmidt.) Price 2 marks.

THIS book contains a semi-popular account of radioactive phenomena. The leading experimental facts and the conclusions of their discoverers are described clearly enough, but with little in the way of suggestive comment. The printing and illustrations are good, but we notice a serious error in Fig. 10, which suggests that the $\beta$-rays of radium, when deflected by magnetic force, lie in the same plane as the poles of the deflecting magnet. The contrary is, of course, the fact, and such a mistake cannot but suggest serious doubts as to the competence of the author's general scientific knowledge. R. J. S.

## 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.*]

### Ionisation and Temperature.

THE discourse by Prof. J. J. Thomson, published in NATURE of March 22 (vol. lxxiii., p. 495), was of importance from several points of view. The explanation of the method of ionisation which he suggests was of especial interest to myself, and I should be pleased if I might be allowed to raise one query concerning it.

Prof. Thomson does not regard the temperature of the gas as having any effect upon the ionisation. It has, indeed, never been shown that high temperature alone would produce ionisation. On the other hand, is there any reason for supposing that ionisation by impact may not take place much more easily at high temperature than at low, and that this is the explanation of the discharge observed by Prof. Thomson? That the gas in this case must have a very high temperature would seem exceedingly probable, for the amount of electrical energy lost in the discharge is very great when compared with the thermal capacity of the gas through which the discharge occurs. Thus in one case when the discharge became luminous the current was 0.045 ampere, the potential difference 50 volts, the distance between the electrodes 5 mm., and the pressure of the gas 0.01 mm. The dimensions of the tube are not given, but if we assume the volume of the gas to be 2 c.c., the residual gas to be atmospheric gas, and that the whole electrical energy is used in heating the gas, we should conclude that it would raise it $7.4\times10^7$ degrees. It is, of course, not to be supposed that the temperature does reach any such value, but we have reason to believe that it reaches a very high temperature, and may it not be that this has a very great effect upon the production of the ions? C. D. CHILD.

Colgate University, Hamilton, N.Y., May 11.

THE average temperature of the gas when the discharge first became luminous was comparatively low; for example, a fine platinum wire immersed in it did not become hot enough to be visible. The figures quoted by Prof. Child refer to the current after the luminous discharge had been well established; the current when the transition from dark to luminous discharge took place was very much smaller, generally less than $10^{-5}$ ampere.

J. J. THOMSON.

### A Horizontal Rainbow.

J'AI étudié récemment un arc-en-ciel horizontal qui se montrait à la surface d'un petit étang dans les premières heures de la matinée. On l'observait, comme celui dont Mr. W. R. M. Church a envoyé la description à NATURE (April 26, p. 608), en tournant le dos au soleil; et il disparaissait quand la hauteur du soleil était de 44° environ. Il avait la forme d'un arc d'ellipse dont un foyer se serait trouvé à peu près dans l'ombre de la tête de l'observateur. Ses caractéristiques étaient les mêmes que celles de l'arc-en-ciel ordinaire: ouverture angulaire de 42° sur le bord rouge, largeur de 2°, apparition à 53° (plus rare) d'un second arc plus faible et plus large avec les couleurs disposées dans l'ordre inverse, obscurité de l'espace compris entre les deux arcs.

Tout invitait donc à chercher l'origine du phénomène dans des sphérules d'eau, qui ne pouvaient être que répandues sur la surface calme. C'est effectivement ce qu'une étude attentive m'a fait découvrir. Les sphérules en question ont généralement quelques dixièmes de millimètre de diamètre. Elles sont très nettement visibles quand on se penche sur l'étang, mais la moindre agitation les fait disparaître. Je les attribue à la rosée déposée à la surface de la nappe tranquille, laquelle est un peu grasse par suite de l'existence de nombreuses colonies d'animalcules et de végétaux dans ses eaux stagnantes. L'arc-en-ciel observé par Mr. Church me semble dû à la même cause: dépôt du brouillard à l'état sphéroïdal sur la surface calme du lac. V. SCHAFFERS.

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