but the yellow, purple and pinkish tinges were most general. The sunsets of the 22nd and 26th and the sunrises of the 27th, 28th and 29th were those which showed the salmon tint to the greatest advantage.

In a letter to NATURE of last week, Mr. Krohn recorded some remarkable sunsets at Madeira, while a *Daily Mail* correspondent at Bombay (June 29) writes:—"The extraordinary red sunsets which have been witnessed for several days past are believed to be due to Martinique dust in the upper atmosphere."

There is little doubt, therefore, that the dust is on the move, being carried by the upper air currents, and perhaps we may yet observe more brilliant effects.

WILLIAM J. S. LOCKYER.

Solar Physics Observatory, June 30.

As one of the first, in your pages, to call attention to the import of the sunset glows in 1883, I have additional interest in noting the recurrence of similar glows during the past few days. On three nights, at least, they have been more marked than any seen by me since the eighties.

I observed the glow first on June 26, at Croydon, but it was noted at Street, Somerset, on the 24th (Tuesday last). I was there from the 27th to 29th, and saw glows each evening. On the 27th it was brighter, though less widely spread, than at Croydon on the 26th. But at Street, on the 26th, I am informed by my cousin, Mr. Joseph Clark, that it was brighter than on the 27th.

The following resemblances to the glows in 1883 may be noted:—

(*a*) The distinct interval between the sunset itself, with illuminated lower clouds, and the glow. The latter began 20 to 30 minutes after sunset.

(*b*) The detachment from the horizon.

(*c*) The shade, pink, ranging from salmon tinges (26th, due perhaps to London smoke-haze) to almost purple.

(*d*) The clear interval between a "glow" and "after-glow" about half an hour after sunset (noted on 28th and 29th).

(*e*) The "after-glow" growing as brilliant as the glow. Indeed, on the 29th it was more brilliant, and alone attracted attention from the ordinary observer.

(*f*) The strong and prolonged "counter glow" above the earth-shadow (specially noted on 28th, up to 8.50, or half an hour after sunset).

(*g*) The prolonged ruddiness along the horizon, signs still remaining on 29th at 11 o'clock.

On June 26 (Croydon) the glow arose to at least 75°; otherwise 55° or so was the extreme limit. So far the pink glows have not been observed later than about 9.10, or, say, 50 minutes after sunset. In brilliancy they cannot compare with those of 1883, but perhaps with the glows two years later.

June 30. J. EDMUND CLARK.

The Halos of May 1, 8 and 22.

SINCE the publication in NATURE of the letters on these three phenomena, my attention has been directed by Prof. S. P. Thompson to the "Memoire sur les Halos," by M. A. Bravais. The first of the above three halos, recorded by Prof. E. E. Barnard, is apparently new, unless the radius of one of the two circles was in reality considerably smaller than that of the other; if this was the case (which from the account seems scarcely likely) this halo might be part of the halo depicted on Plate iii. Fig. 98, and described on pp. 87, 88 and following, and of which Bravais says that the different parts are by no means always visible together.

There is no doubt that the halo described by me is substantially the same as that depicted on Plate iii. Fig. 101, though it will be seen that mine has a cusp not previously described, whilst one of the mock suns given by Bravais is altogether wanting.

Lastly, the halo described by Prof. Grenville A. J. Cole will be found in the same work (Plate iii. Fig. 101), where it is interesting to note that only one parhelion is drawn, and that is the one given by Prof. Cole on the left of the horizontal diameter of the smaller circle. T. C. PORTER.

Eton, Bucks, June 30.

Matter and Motion in Space.

MR. WILLIAM STANLEY, an American philosopher and engineer, said a few days ago that the grandest words ever uttered by any man on this planet were spoken by Lord Kelvin when he said that if all the matter in the universe were reduced to its ultimate atoms and equally divided through all space, the disturbance caused by the beating of the wing of one mosquito would bring about everything that we find in the material universe to-day. I have written to Lord Kelvin asking him where I can find some account of this, but he denies that he ever said anything of the kind. However, as Mr. Stanley declares that it appeared in NATURE, perhaps you can put me in the way of getting a copy of the paper which contains this remarkable utterance, which, by the way, is quite true, and if Lord Kelvin did not say it, I only have to say that he might well have been the author. HIRAM S. MAXIM.

18 Queen's Gate Place, London, S.W., June 25.

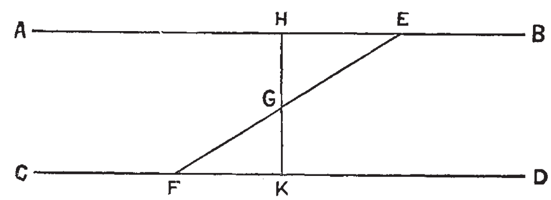
A Method of Treating Parallels.

MAY I venture to suggest through your columns a method of dealing with the theory of parallels which seems to me to possess some advantages?

Since a philosophically rigid proof of their properties may be regarded as out of the question in the present state of our knowledge, the only desideratum in laying the foundation of this important section of geometry is an axiom the truth of which shall be apparent to the mind of a beginner.

I propose that the following should be adopted, as being the property of parallels which is most prominent in matters of ordinary life, and hence to those who have not made a special study of geometry the most obvious:—"A straight line which is perpendicular to one of two parallel straight lines is perpendicular to the other."

The more general property, that parallels are equally inclined to any straight line which cuts them, follows immediately:—



Let AB and CD be two parallels met by a third line at E and F. Bisect EF at G, and draw GH perpendicular to AB and produce HG to meet CD at K. Then HK is perpendicular to AB and CD.

Then in the two triangles GEH, GFK,

angle EHG = FKG (right angles),
angle EGH = FGK (I. 15),
EG = GF (construction).
∴ HEG = KFG (I. 26).

Hartley College, Southampton. S. W. RICHARDSON.

THE FIRST FRUITS OF THE GERMAN ANTARCTIC EXPEDITION.

THE protracted voyage of the *Gauss* from the Elbe to Cape Town excited some anxiety at the time, and called forth a few comments unfavourable to the sailing power of the ship. It appears, however, that the delay was due mainly to the fact that many days were spent in carrying on oceanographical and magnetic work, although the change of programme which led to the abandonment of a visit to Ascension shows that the duration of the passage did to some extent exceed anticipations. The *Gauss*, we may recall, left the Elbe on August 15, 1901, passed the Lizard on the 20th, called at St. Vincent in the Cape Verde Islands on September 11, and reached Cape Town on November 23. The work done in various branches of science was discussed in a preliminary manner on board, and an account of it was issued in March in a paper of

108 pages, with numerous maps and diagrams, by the new Oceanographical Institute in Berlin and the Geographical Institute of the University of Berlin, under the direction of the head of both institutions, Baron F. von Richthofen.[1] The work, though mainly of value in the instruction it afforded the workers, still constitutes a contribution to our knowledge of the Atlantic, and promises well for the scientific harvest which we hope the *Gauss* has by this time begun to reap in less known waters.

The memoir consists of four parts—a general report of the expedition by the leader, Prof. E. von Drygalski, seven reports on the scientific work by the various specialists on board, technical reports by the chief engineer and the captain of the ship, and finally a special report on the establishment of the auxiliary station at Kerguelen.

As the investigators on the *Discovery* brought themselves into working order by monographing the island of South Trinidad, those on the *Gauss* set about the general description of St. Vincent in the Cape Verde group as their first exercise. Dr. Emil Werth describes the topography and types of vegetation of the island, and Dr. Philippi gives a brief account of the geology. The island is described as an ancient volcano, the central plain corresponding to the crater, the rim of which survives in parts as a peripheral mountain-chain.

The more systematic work of the expedition commences with Prof. von Drygalski's report on the oceanographical observations which were his special care. As far as the equator these were confined to the surface, but from the equator southwards deep-sea observations were added at regular intervals, along the course which lay alternately a little to the west and a little to the east of the meridian of 20° E. The superficial conditions are very ingeniously shown by means of curves drawn on the map of the route, the abscissæ being the projection of the track on the meridian and the ordinates the values of temperature, salinity and density *in situ*. The surface temperature, closely following that of the air, rose steadily from 17° C. at the mouth of the English Channel to an average of 27° in the Doldrums (16° N. to 5° N.), then fell to 24° at the equator and remained steady to 15° S., after which it fell steadily, reaching 18° C. in 30° S. The salinity curve showed maxima in the tropics both north and south, separated by a minimum in the belt of calms at 7° N. The density of surface-water *in situ* remained constant between the temperate zone and the tropics in both hemispheres, but fell to a single minimum in the equatorial belt of calms, where the maximum temperature met the minimum salinity. Samples for the determination of density and chlorine were collected every four hours and a number of different methods were employed for making the determinations. Titrations of chlorine were controlled by Knudsen's standard samples of seawater, which were supplied to the expedition for the purpose. In addition to two patterns of direct-reading hydrometers, a set of Nansen's total-immersion hydrometers by the use of which the troublesome factor of surface-tension is eliminated were utilised, and a refractometer was also employed for the optical determination of the density of the sea-water. The value of the salinity deduced by Knudsen's tables from the chlorine determinations was always found a little lower than when deduced from hydrometer or refractometer observations; the mean error of the determinations was found to be least for titration of chlorine and greatest for the refractometer. The chief difficulty with regard to that instrument was found to be the temperature correction; but Prof. v. Drygalski points out the very decided advantage of the immersion refractometer with which the *Gauss* is provided over the differential refractometer formerly used.

[1] Bericht über die wissenschaftlichen Arbeiten auf der Fahrt von Kiel bis Kapstadt und die Errichtung der Kerguelen Station.

The colour of the sea-water was systematically observed, but the range of Forel's xanthometer being found insufficient, the more extensive scale of colours used by Luksch on the *Pola* expedition was adopted instead.

Deep-sea soundings were made with a modified Sigsbee machine. Using a detaching weight of 35 kilogrammes as a sinker, soundings were completed in 5000 metres (2770 fathoms) in seventy minutes in calm weather. Prof. v. Drygalski found the Negretti and Zambra reversing thermometer unsatisfactory for deep soundings, on account of the shaking of mercury out of the inverted bulb in hauling up through the hot tropical surface-water. The Miller-Casella thermometers, on the other hand, acted admirably, and he regretted not having taken a larger supply. We think, however, that in the very different conditions of the polar seas this opinion of the relative utility of the two types of instrument will very likely be reversed.

On the voyage between 37° N. and 34° S. no fewer than thirty successful deep-sea soundings were taken, of which nine gave depths exceeding 5000 metres (2770 fathoms), and the deepest as much as 7230 metres (3950 fathoms). The positions of the soundings were chosen so as to throw light on special problems of suboceanic configuration.

Opportunity was taken to test the Pettersson-Nansen insulating water-bottle in these depths, and the result was to show that the great contrast of temperature between the bottom and surface in the tropical seas was too much for the power of insulation, and that the inner cylinder of water altered its temperature somewhat before a reading could be made. This difficulty will, of course, not be experienced in the more uniform temperatures of polar seas.

An interesting fact brought out by the determination of salinity as well as temperature at each point of observation was that about the depth of 800 metres, where the sudden change in the temperature curve occurs between the warm upper and the cold lower waters, there occurs an actual inversion of the salinity curve, showing that a stratum of minimum salinity is interposed between the two salter layers.

The study of oceanic deposits brought out some new facts, and suggests problems not very easy of solution. By using sounding tubes of 2 or 3 centimetres diameter and 200 centimetres long some very long cores were obtained. One of these, from the depth of 7230 metres (3950 fathoms), in 0° 11′ S., 18° 15′ W., showed distinct stratification. The core was 46 centimetres long; the uppermost 13 centimetres consisted of red clay containing numerous fragments of volcanic rock, then followed in order four bands of different colour, passing from brownish-grey to dark and then light grey. The dark grey layer distinctly resembled a terrigenous deposit, and the light grey layer, the lowest of all, was the only one containing a perceptible proportion of calcium carbonate. The bearing of this observation on past changes in the configuration of the ocean and the distribution of land is pointed out. A still more curious specimen was a core 69 centimetres (say 2 feet) long, obtained in 35° 52′ S., 13° 8′ E., from a depth of 4957 metres (2750 fathoms). The uppermost 11 centimetres consisted of a brown clayey quartz sand with very little volcanic or calcareous material, while the next 12 centimetres were almost pure globigerina ooze with fragments of the upper layer, and the greater mass of the section consisted of material similar to the upper layer, but with the clayey material predominating over the sand. Dr. Philippi could not account for this appearance of sand in a pelagic deposit by considerations of the prevailing wind (which blows towards, not from, the South African deserts), or by currents, so he is driven to suggest that the material is ice-borne, though he acknowledges the difficulty of icebergs in sufficient numbers reaching so low a latitude.

The biological work was very fully developed on the voyage, and in addition to a close watch being kept on the changes in the surface plankton by continuous tow-netting, attention was devoted to the use of very large wide-meshed nets (one was of 7 metres diameter) for horizontal towing, and to a vertical net of 2 metres diameter. A somewhat unexpected result of the latter was the discovery that very young fishes increased in number with the depth. Thus in a vertical draught from 500 metres twelve "fischchen" were found, in one from 800 metres fifteen, from 1000 metres thirty-two, from 1200 metres thirty-six, from 2000 metres forty-three and from 3000 metres no fewer than ninety-six. Most of them belonged to the genus Cyclothone.

Dr. Bidlingmaier enters very fully into the methods and difficulties of magnetic work at sea. The two principal instruments in use are a Bamberg's deviation magnetometer and a Lloyd-Creak inclination instrument identical with that supplied to the *Discovery*. The results are not yet ready for publication, but a number of observations were made both at the ports of call and at sea. At Cape Town Profs. Beattie and Morrison repeated the comparison of their own instruments with those of the expedition which they had made a short time previously with the *Discovery's*, thus enabling a comparison of the instruments of the two exploring vessels to be made.

The report concludes with a letter from the auxiliary station at Kerguelen which was established by Herr Enzensperger on the shores of Royal Sound in November, and was visited by the *Gauss* on her way southward in January, 1902; but the letter had been dispatched some weeks before the ship arrived.

We miss any detailed account of the meteorological work of the expedition, or particulars as to the placing and working of the various self-recording instruments on board.

It is impossible to overrate the importance of preliminary work in comparatively easy conditions before grappling with the manifold difficulties of the polar seas. Indeed, we believe that those who organise polar expeditions for scientific work would be well advised to insist on a preliminary trip of at least three months' duration before the final plans and equipment are settled. The result would not be waste of time; it would render fruitful a vast amount of work, which without preliminary experience is sure to be wasted. In this respect Antarctic expeditions are more advantageously situated than those to the Arctic regions, where the ship is in the midst of its field of work before the men have settled down to life on board and to work under the countless limitations which harass the man of science at sea.

H. R. M.

RURAL EDUCATION IN FRANCE.[1]

ONE is always being reminded afresh of the essential solidarity of the thought of civilised man; no movement seems to begin with one man or in one place; the tide rises, and though this or that first receives the impulse and takes credit for being the creator, yet the wave has already reached many a distant creek and inlet. In two or three years the idea of giving an agricultural colouring to the work of the rural elementary schools of England has been getting itself translated into codes and circulars and syllabuses; the Agricultural Education Committee gave the needful push, but if anything else were wanted to prove that it only supplied the "starter" to a medium already prepared to react, it would be a consideration of the work done in the same direction in France, as set out in the report before us. And the United States, our Australian Colonies and Canada, to name no more cases, would all report similarly—their educators have begun to realise that primary education has been systematised on bookish and artificial lines, which can nowhere be more pernicious or more easily avoided than in the purely country school, with trees and fields around it.

Unfortunately, the pioneers of any movement, just because they are pioneers and have brought a certain amount of original thought to the work, are apt to forget that there must be other people progressing on the same lines; they shut themselves up in their own schemes, and bit by bit work through the same mistakes which everyone else has previously made.

Here comes the special value of such reports as the one we are now considering, and had this account of the attempt in France to impart an agricultural bias to the rural primary school been available a year or two earlier, many experiments destined to failure might have been avoided, and much well-meant effort directed into more fruitful channels.

The problem in France is like that of England, there is the same depression in agriculture, the same dominance of the town in the organisation of the State, the same increasing distaste for a farming life—in a word, the same impossibility of the primitive industry, with its toil, its small returns, its isolation, competing either for men or capital with the specialised affairs of the town. But as Mr. Brereton reminds us, France is more of an agricultural country than we are, so the problem was taken in hand earlier there; the economic difficulties were palliated by protection, and the primary education of the country was overhauled to ensure that it should stimulate, rather than divert, the child's desire to live on the land.

The volume before us consists of two reports; the first is a very detailed account by Mr. Cloudesley Brereton on the organisation of rural education in the Departments of Calvados, Orne, Sarthe, Indre et Loire, Loir et Cher. Here the machinery for the education both of child and teacher; the relations, financial and administrative, between the central authority, the department and the commune; the status of the teachers, the inspectorate, the departmental professors, &c., are set out at length, together with the personal impressions of the author while visiting typical schools in the district indicated. Mr. J. C. Medd, the author of the second report, deals with the country bordering Mr. Brereton's on the north and east; he is, perhaps, more specially concerned with "l'enseignment agricole" than with the general machinery of education. The first thing that strikes us is the predominance given in both reports, and indeed in the French system, to the programme. Most new movements in education narrowly escape being choked in their early days by a programme, and as we in England are still struggling to free ourselves from the wrappings of syllabuses, it is interesting to read how the vastness of the schemes framed by the departments in response to the law of 1879, resulted in practically no teaching except by a few enthusiasts. This was realised, and the Ministry issued in 1897 a well-reasoned scheme "on the teaching of elementary notions of agriculture in rural schools,"[1] which forms the basis of the work that is proceeding to-day. Even this circular seems to err in attempting instruction which is too definitely technical for the primary school, and so degenerates into text-book repetitions. The study of manures and artificial fertilisers has an extraordinary attraction for the sort of man who teaches in a primary school; he needs to be warned that they do not constitute the whole of agriculture, rather than encouraged to devote his "champs

[1] Vol. vii. of "Special Reports on Educational Subjects," published by the Board of Education.

[1] A translation appears in the Report of the Irish Commission on Primary Schools [c 8925].