there is an increase as we approach the plane of the Milky Way. They are, therefore, not limited to the plane. Now we know that these stars are the moribund stars, the stars just disappearing, the stars whose light is waning ; so that soon after the carbon stage they exist in the heavens as dark stars, and we can only know their existence by their gravitational effect upon other stars which are self-luminous. It is also to be borne in mind that these stars, just because they are in their waning

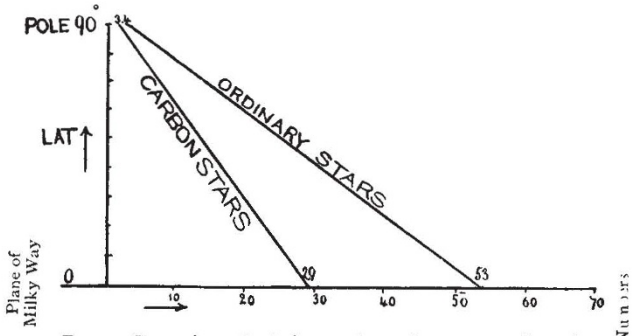

FIG. 2.—Comparison of relative numbers of stars generally and carbon stars.

stage, are very faint ; so that the information we are able to get with regard to them may possibly be information concerning their distribution in parts of space not very far distant from that which we ourselves occupy.

That was in 1884. In 1891 Prof. Pickering, when he found that he had collected something like 10,000 stars in the Draper catalogue, began to consider their distribution in different parts of space in relation to the then classification, which was practically a classification founded on hieroglyphics, since we knew very little about the chemistry of the different bodies at that time.

He found that the Milky Way was due to an aggregation of white stars, by which he meant, as we now know, very hot stars, and the hottest of them, that is the gaseous ones, exist more obviously in the Milky Way than do the others. The proportional number of proto-metallic stars in the Milky Way was greater for the fainter stars than for the brighter ones of this kind, and that at once suggests a possibility that in the Milky Way itself there is a something which absorbs light ; so that the apparently brightest stars are not actually the brightest, but are more luminous because they have not suffered this absorption, and that those which have suffered this absorption may be very much further away from us than the others of a similar chemistry. He also arrived at this extremely important conclusion, namely, that the metallic stars, that is, stars like our sun, stars more or less in their old age, had no preference for the Milky Way at all, but are equally distributed all over the sky. With regard to the group of stars known by metallic flutings in their spectra, he has no information to give us any more than Dunér had, for the reason that their number is small and they have not yet been completely studied.

Only last year this inquiry was carried a stage further by Mr. McClean, who not only photographed a considerable number of stellar spectra in the northern hemisphere, but subsequently went to the Cape of Good Hope in order to complete the story with reference to the stars down to the third or fourth magnitude, which he could observe there. He was very careful to discuss, in relation to the Milky Way and certain galactic zones, the distribution of the various kinds of stars which he was fortunate enough to photograph.

We notice that if we deal with the gaseous stars the numbers in the north and south polar region are small, and that the numbers nearer the Milky Way are greater, so that finally we can see exactly how these bodies are distributed. If we take the gaseous, that is to say the hottest, stars, we find the smallest number in the polar regions ; but if we take the metallic stars we find practically the largest number, at all events a considerable number, in the polar regions. The general result, therefore, is that the gaseous stars are mostly confined to the galactic zones, the proto-metallic stars are not so confined, that is to say, down to about $3\frac{1}{2}$ magnitude. What is also shown there is that the metallic-fluting stars are practically equally distributed over the polar regions and over the plane of the Milky Way itself ; so that, in that respect, we get for these stars very much the equivalent of the result arrived at by Dunér, that is to say, they have little preference for the Milky Way.

(*To be continued.*)

THE PARENT-ROCK OF THE SOUTH AFRICAN DIAMOND.[1]

DIAMONDS were discovered in gravels of the Orange River in 1867, and were traced three years later to a peculiar earthy material called from its colour "yellow ground" by the miners. This, which was soon found to pass down into a more solid and dark-coloured material called "blue ground," occupies "pipes" in the country rock—carbonaceous shales and grits belonging to the Karoo system ; the one standing in much the same relation to the other as do the volcanic necks to the carboniferous strata in Fifeshire. Flows or sills of basaltic rocks are associated with the sedimentary strata, and both are cut by dykes. The matrix of the blue ground is a fine granular mixture, chiefly consisting of a carbonate (calcite or dolomite) and serpentine. In this are embedded grains of garnet (mostly pyrope), pyroxenes (a chrome diopside, smaragdite or enstatite), a brown mica, magnetite and other ores of iron, and some other minerals more sparsely distributed. Rock fragments also occur ; some of them are the ordinary shale and grit, but others are compact and of an uncertain aspect. Crystalline rocks are sometimes found.

As to the nature of this blue ground and the origin of the diamond, very diverse opinions have been expressed. The late Prof. Carvill Lewis considered the former to be a porphyritic peridotite, more or less serpentinised, which sometimes passed into a breccia or a tuff, and the diamond to have been formed *in situ* by the action of this very basic igneous rock upon the carbon present in the Karoo beds. Others, however, maintained that the rock was truly clastic ; being produced by the explosive destruction of the sedimentary rocks, together with part of their crystalline floor—was, in fact, a kind of volcanic breccia, subsequently altered by the action of percolating water at a high temperature. But they also differed in opinion as to the genesis of the diamond itself ; one party holding it to have been formed *in situ*, by the action of water at a high temperature and pressure, the other considering it, like the garnets, pyroxenes, &c., to have been formed in some deep-seated holocrystalline rock mass, and to have been set free, like them, by explosive action.

A few months ago the investigation had advanced thus far : (1) study of the diamonds obtained from the blue ground had increased the probability of their being derivative minerals ; (2) no certain proof of the former existence of a compact or glassy peridotite had been discovered ; (3) certain compact rock fragments, as to the origin of which the writer had at first hesitated to express an opinion, had been determined by him to be only argillites, affected first by the action of heat, then of water ; (4) the diamond and the garnet had been brought into very close relation by the discovery of two specimens, showing the former apparently embedded in the latter. The better of them was accidentally picked up at a depth of about 300 feet in a shaft at the Newlands Mines, West

[1] The substance of a paper read before the Royal Society on June 1.

Griqualand (about forty-two miles to the north-west of the more famous group in the neighbourhood of Kimberley). In this specimen a rather large and irregularly shaped pyrope projects from one end of a fragment of blue ground: one small diamond is embedded in this pyrope, and five others either indent it or are in close contact. Fortunately the discoverer was the managing director of the company, Mr. G. Trubenbach, who appreciated its importance, and so kept a sharp look-out for anything remarkable which might turn up during the excavations. Accordingly he preserved specimens of certain boulders, sometimes over a foot in diameter, well rounded and just like stones from a torrent, which occasionally occurred in the blue ground at various depths down to 300 feet. Several of these contained garnets, being varieties of eclogite, but diabase was also obtained.[1] Some of these Mr. Trubenbach brought to London, and on the outer surface of one a small diamond was detected. The boulder was broken, and others were exposed. A fragment (rather less than a third) was sent to Sir W. Crookes, who entrusted it for examination to the writer, and to him Mr. Trubenbach afterwards sent other boulders, besides rock and mineral specimens, with the permission of the directors.

In addition to the boulder of diabase, which has no special interest beyond the fact of its occurrence, there are six boulders of eclogite (one perfect, the rest having been broken), all but one (which may have been four or five inches long) measuring a foot across, more or less. Three of these consist almost entirely of a garnet (pyrope) and an augite (chrome diopside), the former varying in size from a large pea downwards, and the other mineral corresponding. The pyrope is often surrounded, especially towards the exterior of the boulder, by a "kelyphite rim" consisting mainly of a brown mica. This and a few other minerals were present elsewhere, but in very small quantities. The remaining three boulders consisted of the same two constituents, with the addition of a considerable amount of a variety of bastite and a few flakes of brown mica. Of the first group of specimens two contain diamonds, the first-named having at least nine and another certainly one, perhaps a second. All are small, the largest being about ·15 inch in diameter. They are well-formed octahedra, with slightly stepped faces, perfectly colourless, with an excellent lustre. Evidently they are just as much an accidental constituent of the eclogite as a zircon might be of a granite or syenite.

This discovery leads to the following conclusions. As the diamond is found in boulders of eclogite, and these are truly water-worn, that rock is the birth-place, or at any rate one birth-place, of the diamond (for its occurrence in a more basic species, such as a peridotite, may be expected). Hence the diamond is not produced in the blue ground, but is present in it as a derivative from older rocks, in the same way as the olivine, the garnets, the various pyroxenes, &c. Moreover, the blue ground is a true clastic rock, and not a serpentinised peridotite of any kind, so that the name Kimberlite, proposed for it by Prof. Lewis, must disappear from that group. The rock is a volcanic breccia, though a rather peculiar one, for scoria has not yet been detected in it. Probably it was formed by explosions due to pent-up steam, the vents being driven through the upper part of the crystalline floor and the overlying sedimentaries. These never ejected lava, and were soon choked up with shattered material. Through this, in all probability, steam or heated water continued to be discharged for a considerable time, which accounts for the marked changes effected in the exterior of the larger fragments and in the more finely pulverised material of the matrix. T. G. BONNEY.

[1] The occurrence of boulders in the blue ground at De Beers Mine was asserted by Stelzner in 1893 (*Sitzungber. u. Abhandl. der Isis*, 1893, p. 71).

NOTES.

WE are informed that copies in bronze of the medal presented to Sir G. G. Stokes at his jubilee can now be obtained from Messrs. Macmillan and Bowes, Cambridge, price 15*s.* each.

AT the opening meeting of the new session of the Institution of Civil Engineers, on November 7, an address will be given by the president, Sir Douglas Fox, and the prizes and medals awarded by the Council will be presented.

A GOLD medal is offered by the Cercle industriel agricole et commercial, Milan, for the description of a method, or the construction of apparatus, which will assist in the prevention of accidents to artizans engaged in electrical work.

A CONVERSAZIONE of the Geologists' Association will be held in the library of University College on Friday, November 3. A number of pictures and objects of geological interest will be on view during the evening.

THE Allahabad *Pioneer Mail* (October 6) states that Mr. Douglas Freshfield has started from Darjeeling, with a party of friends and Alpine guides, to explore the glaciers and little-known passes of the Kanchenjunga range. The exact course to be pursued is probably unknown to the party themselves, who must be guided by circumstances; but any addition to the scanty and inaccurate information at present extant on the subject of the Himalayan giant will be welcome to geographers.

IT is stated that another British exploring expedition to Abyssinia has been arranged, and will leave England at once. The members are Mr. James J. Harrison, Mr. Powell Cotton, Mr. W. Fitzhugh Whitehouse (of Newport, Rhode Island) and Mr. A. E. Butter. Mr. Donald Clarke will go as surveyor and geographer, and a taxidermist will also accompany the party. The objects of the expedition are scientific and sporting, and it is expected that the journey will occupy about nine months.

THE thirty-eighth annual general meeting of the Yorkshire Naturalists' Union is to be held at Harrogate to-day, and an address upon the evolution of plants will be given by Mr. William West, the retiring president. The Union is a model of a well-organised local society, which not only serves to develop interest in science, but also assists in the extension of natural knowledge. The membership is not in any way commensurate with the importance of the work carried on, and we are glad to see that efforts are to be made during the forthcoming winter to bring the claims of the Union for support before the naturalists and the public of the County of York.

THE *British Central Africa Gazette*, published at Zomba, always contains several items of scientific interest, and the latest number received, dated August 24, is not deficient in this respect. We learn from this source that Mr. J. E. S. Moore has been taking soundings at the north end of Lake Nyasa. Off Ruarwe a depth of 418 fathoms was found, and off the higher parts of Livingstone Range bottom was reached at 210 fathoms.—Mr. Poulett Weatherley describes in a letter a difficult journey up the Luapula, and through its innumerable rapids. The Luela is regarded as the second most important tributary of the Luapula, but there is little to choose between the Luombwa, the Luela, the Mwyangashe and the Luongo, though the Luombwa is the largest and most delightful of the four.

REUTER'S correspondent with Major Gibbons' trans-African expedition reports from Lialui (Barotsiland), in a despatch dated August 5, that much valuable exploring work had been done by the members of the expedition. The routes traversed by the travellers since last January amount in the aggregate to 3500 miles, mostly through unknown or unexplored districts.