

or over, not one is considered to have components of the same colour. And of the forty-two pairs which are said to be of different colour all but two have more yellow in the brighter, so much so indeed that it is possible to suppose that the difference of brightness is the chief cause of the difference of colour. The two exceptions are:—

No. 23. *ε Boötis* A. eq. Cærulea B. eq. Cærulea
No. 42. α 507 A. Blanche B. Cendriolivatre

There is evidently some error about No. 23. Either the colours are wrong, or it is wrongly stated to have differently-coloured components. In No. 42 it is difficult to say which component is more yellow. Although, then, it is certain that other causes largely affect the colours of stars, yet differences of brightness seem to have the greatest effect in producing the apparent differences in the colours of double-stars.

Prof. Holden compares the colours of bright and faint stars to those of a more or less hot incandescent body. But in the latter case the dimmer light is accompanied with redness. We know that this is not the case with the light of our own sun; for of a white surface, upon part of which the sun shines, while the rest is in shadow, the darker part is bluer. In the same way, of the forty binaries of which the brighter component is the yellower, there are thirty-seven in which the fainter is bluer, and only three in which it is distinctly redder. It appears, therefore, that most double-stars do not differ greatly in colour from our sun, and do not shine with the strongly red light of an incandescent solid.

C. S. PEIRCE

Paris, July 20

Coffee-Disease in New Granada

THE following information about what appears to be a new disease of the coffee-tree is taken from an official letter written on April 29 last by Mr. C. Michelsen, Commissioner of Agriculture at Bogotá, to Mr. José Herrera, Vice-consul of New Granada in this city, who sent me a copy of it, requesting me to give him my opinion about the disease.

At first there appear on the leaves small spots of a light-greenish colour, which in two or three days turn brownish, and then appears on each of them a fungus *divided in three or more greenish-yellow branches*. This fungus is said to be phosphorescent at night, and *in places where it is very common a phosphoric smell is noted* (!) After some days the diseased leaves fall off; the fruits, which also are attacked by the parasite, follow very soon, and the trees are left quite bare. They form, however, new leaves after some months, but these are again attacked by the fungus.

The disease is reported to be more frequent in damp places than in dry ones, its ravages being greatest in plantations where the trees are planted rather close. The fungus has also attacked the shade trees, especially the *guamos* (*Inga* sp.).

Though the description is far from being satisfactory, I think it is pretty clear that the fungus is not the *Hemileia vastatrix* of Ceylonese celebrity. However it bears a great resemblance to it, so that I recommended to employ fumigations with sulphur under the kind of large umbrella proposed by Mr. George Wall (*NATURE*, vol. xix. p. 423). The unusually rainy weather in the last year has very likely much to do with the spread of the disease, which at the same time is a new proof of the eminently fatal consequences resulting from close planting.

I have asked for dried specimens of diseased leaves, in order to submit them for examination to a competent mycologist.

Caracas, June 26

A. ERNST

Toughened Glass

PROBABLY the accident mentioned by Mr. Noble Taylor is not exceptional, as a similar one happened to a member of my own family. She was about to take a seidlitz-powder, and had poured the contents of the blue paper into a tumbler of toughened glass half filled with cold water, and was stirring it gently to make the powder dissolve, when the tumbler flew into pieces with a sharp report. There was no fire or lamp in the room at the time. Some of the fragments flew to a distance of three or four feet. The bottom of the tumbler was not altogether fractured, but cracked into a number of little squares, which could be separated readily.

T. B. SPRAGUE

Edinburgh, July 20

THE same accident occurred to me a few nights ago as happened to your correspondent, and I cannot help thinking that the spoon had most to do with the phenomenon.

In a hot room I had just finished what is usually called a "lemon squash," *i.e.*, the juice of a lemon and a little white sugar, with a bottle of soda-water, a lump of ice being put into the mixture. I was talking at the time, and so held the empty glass with a spoon in it in my hand for a second or two, when suddenly it went off in my hand into thousands of pieces, none larger than an inch or so.

I picked up one of the largest and thickest pieces, and found it to be so thoroughly disintegrated that I broke it up with my fingers into about a hundred small pieces, and might have done more. This disintegration seems to be a natural property of toughened glass when broken, but I never before saw a case of its breaking up without being struck. I do not think that usually such occurrences are dangerous, on account of the entire destruction of the fabric.

J. C. J.

Large Hailstones

ON Tuesday, July 13, at 2.30 p.m., hail began to fall heavily in this neighbourhood. A thunderstorm was at the time approaching rapidly from the north-east. I was struck with the extraordinary size of the stones, and going into the open air I collected six—the first that came to hand—in an accurately-tared glass, and weighed rapidly. The six stones weighed 5.766 grams. The average weight for each stone was therefore .961 gram, or 14.8 grains. A pane of glass in a skylight window had a hole driven through it by one hail-stone.

GEORGE PATERSON

Borax Works, Old Swan, Liverpool, July 14

CHATEL, JERSEY.—Please send exact address.

PAUL BROCA

THE sudden death of the eminent French anthropologist, Dr. Paul Broca, which we announced a fortnight since, is an irreparable loss to science, and for the French medical and anthropological schools particularly.

Prof. Broca, born in 1824 at Ste. Foy la Grande (Gironde), was a senator, vice-president of the Academy of Medicine, officer of the Legion of Honour, and member of several learned societies. Since 1846, the year in which he was promoted Aide d'anatomie, till 1880, when he died as a professor of surgery, during nearly thirty-four years the life of Dr. Broca has been an uninterrupted consecration to science. A rapid review of his scientific work, especially of what he did for anthropology, will show how indefatigable was his zeal, how well his life has been spent.

Broca's publications on various subjects in anatomy, surgery, and anthropology are innumerable, especially his contributions to the last-mentioned subject. One has only to open the numerous volumes of the *Bulletins* of the Paris Anthropological Society, of the *Mémoires* and the *Revue d'Anthropologie* and other scientific journals, to get an idea of Broca's immense activity. In 1856 he published his famous "Traité des Anéurismes," which, with his "Traité des Tumeurs," published in 1866, constitute his principal medical works. The former opened a new era in the treatment of these affections; in the latter Broca expounded the historical evolution of the knowledge of tumours and their treatment in so able a manner that it has hitherto not been surpassed.

In 1861 Broca made his remarkable discovery of the seat of articulate language at the third frontal convolution of the left side of the brain. Moreover in later years Broca devoted himself to the study of the brains of man and animals, greatly contributing to our knowledge on that subject. The *Revue d'Anthropologie* contains many of the results of these studies; for instance, "Sur la Topographie cranio-cérébrale," "Étude sur le Cerveau du Gorille," "Anatomie comparée des Circonvolutions cérébrales," "Localisations cérébrales," &c.

His treatise "Des Phenomènes d'Hybridité dans le Genre humain" appeared in 1858 and 1859, and in 1864 was translated into English.

Among the great number of memoirs may further be mentioned: "L'Intelligence des Animaux et le Règne humain," "La prétendue Dégenérescence de la Population française," a brilliant plea for the French nation, "L'Ordre des Primates; Parallele anatomique de l'Homme et des Singes," "Recherches sur l'Indice Nasal," "Étude sur la Constitution des Vertèbres caudales chez les Primates sans Queue," "Les Troglodytes de la Vézère," "La Race Celtique ancienne et moderne," "Étude sur les Propriétés hygrométriques des Crânes," "Sur l'Origine et la Répartition de la Langue basque," "Recherches sur l'Indice orbitaire," "Sur l'Angle orbito-occipital."

The practical results of a good deal of Dr. Broca's anthropological researches are found in his "Instructions," forming two separate volumes; one, for the anthropological study of the living, appeared for the first time in 1864, and has been re-edited several times since; the other, particularly on craniology and craniometry, was published in 1875. Another valuable memoir is that on the "Indices de Largeur de l'Omoplate chez l'Homme, les Singes et dans la Série des Mammifères," in which he opened up new views on the comparative anatomy of races and mammals. One of Dr. Broca's last works was his important study on the "Variations craniométriques et de leur Influence sur les Moyennes," &c.

The greatest glory of Broca is perhaps the foundation of the Anthropological Society of Paris in 1859. The perseverance and talent of the founder surmounted all the difficulties and troubles of every kind which threatened in the beginning the existence of the society, which now, after nearly one-and-twenty years, is flourishing as one of the first learned societies in Europe. During these long years Broca was the soul of the anthropological movement in France; nay, we may say that his influence extended far beyond his own country, and that the study of man in other civilised countries has been followed after his method. In reality Broca was at the same time the founder of a new and excellent anthropological school: his method of anthropometry, &c., as expounded in the "Instructions" above-mentioned, is now followed by the great majority of anthropologists. But this was not enough for the indefatigable zeal of the eminent scholar; in 1872 he commenced to publish the *Revue d'Anthropologie*, one of the best organs on the science of man. Many of his own works have been published in it.

Broca's last and greatest work was the foundation in 1876 of the now celebrated École d'Anthropologie in Paris, with a first-rate museum, laboratories, library, and a complete course of anthropological lessons given by more than half-a-dozen professors, among whom are de Mortillet, Bertillon, and Topinard. Broca himself taught the comparative anatomy of the Primates.

The laboratories above-mentioned belong at the same time to the École pratique des Hautes Études since 1878.

Broca, the scholar, philosopher, and statesman, died on the field of honour, in the midst of his work, in the vigour of life. Though dead, his work will never perish; man dies, but science remains. His illustrious example will continue to enlighten the path of those who follow the imperishable footprints he has left.

H. F. C. TEN KATE

THE WOOLWICH GUNS

A PETITION signed by several men well known in the field of mechanical science and presented to the House of Commons last week contains many points to which it is important that public attention should be directed. The memorialists state their belief that the system of heavy ordnance now in use and known as the Woolwich system is inefficient and dangerous, that, con-

sidering the increasing dependence of the nation for food supply upon its command of the sea, it is evidently unsafe to neglect any of the opportunities which the mechanical skill and manufacturing resources of the country afford for securing the best weapons of offence and defence for our fleet and our army; "that, having regard to the advances constantly being made by private manufacturers in this and other countries, and to the ordnance actually in use or in course of construction for the other Powers of Europe and America, your petitioners look with dismay upon the defects of the English heavy guns, and they are of opinion that these defects seriously endanger our naval supremacy and our national safety." Further the petitioners maintain that it is not right that the heads of the manufacturing department, which is in competition with outside manufacturers, should be the official advisers of her Majesty's Government as regards new inventions, and that the defects in our present system of ordnance arise and are likely to continue from the absence of independent criticism, and in consequence of the technical advisers of the Government being the same persons as those who either are or have been in charge of the manufactories responsible for these defects; that there are in existence several systems of ordnance superior to the Woolwich system, and that it is of national importance that private establishments for the production of arms of all kinds should be encouraged and should not be crushed by giving a virtual monopoly to the Government establishments, but that the private trade and the Government factories should rather serve as reserves to one another.

The principal issues thus raised may be very shortly stated. If we want the best guns, can they be obtained better from a Government manufactory carefully fenced round by official jealousy, or can a better article be procured by open competition amongst private manufacturers? Is it impossible for the technical advisers of the Government to select from the enormous mass of inventions and improvements offered to them those of real value? And further, do they, or would they make this selection if it were in their power? It has often been objected that the great quantity of suggestions and friendly advice constantly being received renders it quite impossible to treat them with adequate discrimination; but if the officials intrusted with this work were only possessed of a thorough scientific knowledge of mechanical principles, we believe that nine-tenths of the worthless schemes could be at once rejected, so inevitably does the mark of the circle-squarer appear in his work to one who knows where to look for it.

Respecting the remaining 10 per cent. of inventions and improvements, it would probably require somewhat greater practical judgment to decide which were worth further investigation; but while we do not for a moment suggest that the whole of these should be examined and tested at the expense of the tax-payer, it is at least not too much to expect that an obviously good design should not be rejected with an official reply. Inventors are probably the most persevering of all men, and, fortunately for the cause of progress, though not perhaps for their own advantage, they have a greater belief than any one else in the results they hope to obtain; but it is hardly to be expected that they will bestow their whole powers of persuasion on the authorities of their own country when they plainly see a more open field abroad.

For instance, there can be little doubt that the Whitehead torpedo might have been a secret exclusively the property of this country if the inventor had been afforded a fair investigation; again, it would be interesting to know whether the Russian Government required as much persuasion to induce them to adopt the Moncrieff hydro-pneumatic gun-carriage as has been expended in bringing it as far as the "experimental" stage in our own service.

That many inventors have had a short innings at the