Dense glass shows the same defect, besides its great liability to become tarnished.

Another advantage possessed by phenyl-thiocarbimide is its very high boiling-point, viz. 222° C. It is practically non-volatile at ordinary temperatures, and a lighted match may be put into it without setting it on fire. It has, of course, the pungent smell characteristic of all the mustard-oils (to which class it belongs); but this, from the slight volatility of the substance, gives no practical inconvenience.

It dissolves iodine freely, but, from the complexity of its molecule, we cannot expect it to be so diathermic as carbon disulphide. It also readily dissolves metacinnamene (one of the most highly-refractive resinous substances that I have been able to meet with; $\mu_D = 1.6$, nearly), and the viscous solution is useful in determining refractive indices by Wollaston's total reflexion method, or Bertrand's modification of it.

It can be safely used in the ordinary hollow prisms, as it has no action on the mixture of isinglass and sugar with which these prisms are cemented.

H. G. MADAN.

Eton College, August 28.

Michell's Problem.

I HAVE read with considerable interest the short letter in NATURE of August 9 (p. 342), in which Mr. Joseph Kleiber refers to a paper of his own on the controversy between Michell and Forbes, and notices what he believes to be a mistake in my paper of July 19 (p. 272). Mr. Kleiber shows that the experiments of Forbes on random distribution by scattering rice over a chess-board, and also some additional experiments of his own on numbers taken successively from a table of logarithms, are in accordance with the ordinary formula for finding the probable number of squares containing r grains, where m is the number of squares and n the total number of grains—

$$m p_r = m \{n (1/m)^r (1 - 1/m)^{n-r} / r! \}^{n-r}.$$

He concludes that "the theory of probabilities does not affirm that 'a perfectly uniform and symmetrical disposition of stars over the sky would (if possible) be that which could alone afford no evidence of causation or any interference with the laws of random.'"

Forbes, throughout his paper, is not attempting to controvert either the theory of probabilities, of which he himself makes frequent use, or the result arrived at by Michell and Struve, but only Michell's method of applying the theory of probabilities to prove his point. Hence it seems to me that Mr. Kleiber's paper is not so convincing as he takes it to be; one may agree with his experiments, mathematics, and conclusion, without admitting the truth of Michell's argument.

Mr. Kleiber's second objection is, I think, founded on a misconception due possibly to too great regard on my part for the exigencies of your space. As an example of distribution, I suggest a number of stars shot at random from the centre upon the interior surface of a sphere. The idea may be roughly represented by the explosion of a small uniform shell of shot in the centre of a globe lined with clay. I then attempt to prove that the chance of exactly uniform distribution is *nil*, and proceed: "Michell, however, seems to assume this probability to be 1, or certainty." Mr. Kleiber strongly repudiates any such assumption on the part of Michell. It is always, I admit, a little doubtful to attribute to anyone an opinion which is not distinctly stated, but to Forbes, as well as to myself, the assumption seems to be clear. For if the distribution is not uniform, and any groups of stars are formed, Michell's argument applies in its entirety, and he would prove, of course with greater or less probability, *a posteriori* that the arrangement is due to a cause, while *a priori* from the datum of shooting out at random, the distribution is due to chance.

SYDNEY LUPTON.

Remarkable Rainbows.

ON Saturday, at 3.15 p.m., there was a very brilliant primary rainbow, and a faint secondary bow above. Inside the primary, at first to the right of the centre, afterwards over the entire centre, were two other very faint bows, their colours in the same order as those of the primary, but with no distinguishable red, the violet of the upper bow seeming to touch the orange of the bow below in each case. Green was the most striking colour in the two inner bows, whose breadth appeared equal to each other, but considerably less than that of the primary; part of

this effect being due to the loss of the red, probably all the remainder to irradiation. The perfect primary arch lasted fifteen minutes; an arc of the eastern side half an hour. The sun being comparatively high, the centre of the arch was low, and the bow looked flat. There was no wind, and many of the rain-drops were large, others mere dots.

At 5.5, during a thunder-shower, there was a fairly bright primary with perfect arch, and two faint arcs of a secondary bow, but I saw no trace of inner bows. This primary differed in height and brightness from the other, and the rain was a downpour of heavy drops.

Judging by relative brightness, the inner bows should seldom be seen.

L. J. H.

Rock Ferry, August 27.

I HAVE been unable to send sooner the following, which you may perhaps think worth inserting in NATURE.

On the 18th of July, at 7.30 p.m., I saw a most remarkable rainbow. A sudden light fell on the book I was reading, so powerful that I thought it must be some neighbouring house on fire. It was a rainbow coming across the mountains opposite (Savoie), and ending in the lake just at the "Bec de Peilz," which some of your readers will know. It was only a section of the rainbow, and was not continued in any other part of the sky, and it was so small a section that it scarcely appeared bent, but looked like a fiery column coloured as a rainbow, but having the peculiarity of *not showing the mountain through it*: it cut it sheer off, and yet the mountain was looking unusually dark, and indeed the brilliancy of the sunset was such that all came out in strong relief. The sky was covered with stormy clouds with breaks of brightness, and above this column they hung in golden radiance such as only painting could faintly convey an idea of. Certainly I never saw so beautiful or curious a sight. It lasted about six minutes.

M. C. C.

La Tour de Peilz, August 17.

Sun Columns.

I HAVE never before seen the phenomenon of sun columns in such splendour as on the 11th inst. The day was very hot, the wind a pretty stiff westerly one, and the sky perfectly cloudless. After sunset, which (according to the calendar) took place at 7h. 27m. p.m., several sun columns became visible. They were seen to grow in length, and at 7h. 40m. they extended over the whole sky. The columns were five in number, and pretty regularly distributed, so that one passed through the zenith, two on the north, and two on the south of it at equal distances. A very small cloud was visible at that time in the west-north-west. The colour of the shades was dark blue, and their width in the zenith from 2° to 4° . The lighted parts of the sky had a pale violet colour. The rays extended over the whole sky like meridians on a globe, and all five columns were seen to meet in one point in the east-south-east, about 5° above the horizon. The phenomenon could be seen well in all its extension, as I watched it from a hill 688 metres above the sea-level. The intensity of the colour of the columns was at its highest at 7h. 45m. (Prague local time), and it disappeared at 7h. 50m.

I hope, Sir, that you will be able to mention this not very common phenomenon in the columns of NATURE.

St. Benigna, Bohemia, August 14.

B. BRAUNER.

Meteor.

THE most brilliant meteor I have ever seen flashed across the sky here from east to west, about 7.10 p.m. on the 30th ult. I was riding along a dark road, looking downwards, when suddenly the road was so brightly lit up that I thought the lamp-lighter had lit another lamp. Seeing neither lamp nor lamp-lighter, I looked up, just in time to catch a glimpse of the meteor. It was of an intense white colour, with a train or track of white behind it. When about 45° above the horizon, it appeared to burst like a sky-rocket, but not so violently. It lasted about two seconds.

H. W. L. HIME.

Coonoor, Madras, August 1.

P.S.—August 2. Since writing my letter of yesterday I am informed by Lieut. M. de Montmorency, Hampshire Regiment, that the meteor I mentioned burst *with a loud noise*. I can only suppose that the noise of my horse's hoofs prevented me from hearing it.—H. W. L. H.