in many cases returns when the pressure is relieved. The appearance then suggests a lamp alternately extinguished and relit.

The same precautions as to the smallness of the test-pieces and the absence of a comparatively soft bed under the coloured layer have to be observed in the case of metallic feathers.

The colours of anilin films are not affected by pressure otherwise than by the optical contact between them and the upper quartz lens.

The same may be said of the colours of tempered steel, etc. A simple experiment is to heat a piece of polished steel and to remove by polishing a narrow band of the coloured part. Then form a series of Newton's rings, having this band as a diameter. It will be found that in the straw-yellow of the tempered part the rings are scarcely displaced as they cross the band. Further, it may be noticed that when any of the colours are gradually polished off the colour does not change as the thickness of the layer is reduced but merely becomes fainter.

From this it may be gathered that the colours of tempering are not due to interference, at any rate in the ordinary sense in which the word is used.

A. MALLOCK.

The Tendency of Elongated Bodies to Set in the North and South Direction.

THE letters of Sir Arthur Schuster and Col. E. H. Grove-Hills in NATURE of October 20 and November 24 under the above heading are interesting, as is also the article by Mr. W. D. Lambert in the *American Journal of Science* for September last, to which reference is made by the latter, but the extremely weak gravitational force dealt with cannot possibly have any appreciable effect on my apparatus, and is certainly quite inadequate to account for the results of experiments made with it. Indeed, I gather from some of Sir Arthur Schuster's remarks that he feels that this is the case. The force that I have found to exist is another altogether, as I am confident anyone who has watched the experiments under favourable conditions would admit.

Mr. Lambert in his article is referring to a suspended rod of 40 cm. length, weighted at both ends, and finds for this that the force was only 1/400,000th of a dyne or 1/400,000,000th of a gram. Now, what conceivable effect can such a force have on a vertically suspended circular ring or disc of the thinnest paper, or other light material, of only 3½ cm. diameter? And yet it is with these that some of the most decisive results of my experiments have been obtained. Under favourable conditions the N. and S. directive force acting on the disc is by no means insignificant, and, indeed, when the sky is clear, the barometer high and steady, and there is no wind, it is frequently strong enough, when the apparatus is placed on high level ground in the open, to cause the disc to come to rest in the true N. and S. direction in less than five minutes, or to oscillate fairly rapidly (about five seconds interval) a few degrees on either side of this line. Moreover, other conditions are inconsistent with any purely gravitational theory being the explanation. I have used both suspended discs and pointers floating on paraffin oil, and obtained about the same results from both; not that one gives the E. and W. direction and the other the N. and S. The only difference noticed was that the floating pointer took longer to come to the N. and S. line. Further, it is not necessarily the elongated diameter that turns N. and S., as Sir Arthur Schuster assumes. For instance, if a strip of aluminium about 1 in. wide is coiled round into the form of a ring and then flattened so that the sides almost touch each other, when suspended vertically the flat-surface sides turn N. and S., as in the case of the ordinary discs. Now, if these flat surfaces are pulled out so as to form a ring with the elongated horizontal diameter several times as long as the breadth of the strip, it is not this elongated diameter that turns N. and S., but the surface breadth of the strip as before. In fact, there is no alteration in the direction, but the surface sides of the aluminium strip take up the same direction as when they were flattened close together.

In rainy weather, or when the sky is clouded or the barometer is falling, no satisfactory results can be obtained, and the disc will then usually turn approximately towards the bearing of the thickest clouds. From repeated experiments it has been found that when the apparatus is placed in an iron bucket covered with an iron lid, the N. and S. directive force ceases to act upon the disc, although it may be fairly strong in the open at the same time. The force appears to be strongest in still, frosty weather, when the sky is clear, even though there may be some ground mist.

Since the apparatus was exhibited at the Royal Society's conversazione in May of last year many more experiments have been made by observers in different parts of the world, extending from Spitsbergen in latitude 80° N. to the top of the Cameroon Mountain (13,353 ft.) close to the equator, and from Canada and the United States to the Red Sea, all of which give much the same results that I and others have obtained in this country; so whatever may happen in other parts, there can be no doubt that over this wide area of the earth's surface this N. and S. directive force does exist. In one or two other cases the results have been indefinite, owing apparently to the observers having no proper apparatus or the weather conditions being unfavourable. It is perhaps too early yet to speak positively about the nature of this N. and S. directive force, but the conclusion I have come to is that, in the main, it must be electric, and is probably due to the earth rotating in an electric field.

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Table for the Duration of Sunset.

THE subjoined table was made thus:—From Table VI. in the American Nautical Almanac, for each date and latitude indicated, the hour of sunset on the meridian of Greenwich is taken and corrected for equation of time, giving an hour-angle precise within 1m. or 15′ (as both local mean time and equation of time are rounded off to the nearest minute). From latitude, declination, and this hour-angle the semi-duration of sunset in arc minutes is computed by the differential formula,

$$(1)\quad dP_1 = \cos h\ dh / \cos\phi \cos\delta \sin P_1,$$

in which P_1 = hour-angle, h = altitude of sun's centre, ϕ = latitude, δ = declination, and dh = sun's semi-diameter. As the hour-angle found from the Nautical Almanac is for the end of sunset, it is corrected by subtracting this approximate semi-duration, and the final value in mean time seconds is found by

$$(2)\quad dP = 8 \cos h\ dh / \cos\phi \cos\delta \sin P,$$

in which all sines and cosines refer to mid-sunset,