ever, that even this little may do some good, for it does seem hard, when the labours of men like Fritz Müller, Weismann, and Lubbock, are throwing light on this intricate subject, that darkness should return in the form of manifest misconceptions of well-known pheonomena. B. T. LOWNE

99, Guilford Street, W.C.

Aspect

MR. LAUGHTON'S *aspect* is not only a felicitous word in relation to a plane, but it is susceptible of a wider application than that which he proposes for it, since it expresses a fundamental idea in the theory of surfaces. Every *surface* has at every point an *aspect*, which is the direction of a normal at that point. This may be regarded as the first property of surfaces, for if we define a surface as that form of extension which has at every part two and only two dimensions, we virtually say that, among all the directions in space that radiate from any point of the surface, there is one and only one perpendicular to all those (infinite in number) that lie within the surface at that point; in other words, that the surface has a normal at every point. A plane is then a continuous surface which has *the same aspect throughout*, the angle of two planes is the measure of *their difference in respect of aspect;* parallel planes (as Mr. Wilson points out) are those which have *the same aspect*, a plane tangent to a surface is one which contains a point of the surface, and has *the aspect of the surface at that point*, and a line tangent to a surface is one that contains a point of the surface, and has *a direction which lies within the surface* (or is perpendicular to the normal) *at that point*. Then *a straight line tangent to a plane lies wholly in the plane*, and if such a line, passing through any assumed point of a plane—rotate about that point—always remaining tangent to the plane, it must sweep *every point of the plane*, for it will generate a continuous and infinite surface coincident throughout its extent with the plane, and the plane, being continuous, can have no points without this surface. Therefore, *a straight line which joins two points of a plane lies wholly in the plane*, whence the propositions that *a plane is determined by three points*, and that *the intersection of two planes is a straight line*, together with the other elementary theorems of the geometry of space, are readily derived.

The use of *aspect* in the sense now proposed is not absolutely new, as Mr. Proctor (NATURE for October 26) seems to argue. It has the high authority of Sir W. R. Hamilton in his "Lectures on Quaternions" (1853). Thus we read on page 92 (the italics and capitals of the original are preserved):—"A biradial has also a PLANE and an ASPECT, depending on the *star* or *region* of infinite space, towards which its plane may be conceived to FACE. . . . When two bi-radials have, in the sense just now explained, the *same aspect*, their planes both facing at the same moment the *same star*, they may be said to be CONDIRECTIONAL BIRADIALS. When, on the other hand, they face in exactly *contrary* ways, and, therefore, have OPPOSITE ASPECTS, they may be called CONTRADIRECTIONAL. . . . Both these two latter classes may be included under the common name of PARALLEL BIRADIALS, so that the PLANES of any two *parallel biradials* are either coincident or parallel."

Vaguely, indeed, *aspect of a plane* may be used in the sense Mr. Proctor would assign it, as well as in several other senses. But if we could give it an exact and technical signification, that which is proposed by Mr. Laughton seems to issue directly from the proper meaning of the word; and it is a signification which no other word yet suggested will so easily bear. At present, therefore, it ought to be accepted as the very word that is needed in the re-construction of geometry.

As for *position*, it is pertinent to ask whether anyone would say that parallel planes have *the same position*. The attribute of planes, for which a word is demanded, is precisely that *element* of position in which parallel planes agree; and the *position* of a plane requires for its determination not that element only, but also some other element whereby the plane shall be distinguished from its parallels.

Permit me, by way of appendix to my too long note, to call the attention of those who are interested in the *early* teaching of Geometry, which has lately been discussed in your columns, to Dr. Thomas Hill's "First Lessons in Geometry. Facts before Reasoning." (Boston, 1856.)

J. M. PEIRCE

Cambridge, Massachusetts, Nov. 15

Cause of Low Barometric Pressure

IN the number of NATURE for July 20, 1871, I find a paper by Ferrel, "On the Cause of Low Barometer in the Polar Regions," &c. The author says that the law which deflects a body to the right in the northern hemisphere and to the left in the southern is not understood by meteorologists, and that it is admitted only when the movement is north and south.

I believe this law is now admitted by almost all meteorologists. The proof of it is the general acceptance of Buys Ballot's law of winds, which states that the wind will always blow towards a barometrical depression, and be deflected to the right in the northern hemisphere.

The most important meteorological works of the last years are based on this principle, as, for example, Buchan's "Mean Pressure and Prevailing Winds," and Mohn's "Storm Atlas." Mr. Mohn states the error which was committed in former times, and gives the expression of the deflecting force (page 17).—15°. sin L. (latitude) per hour. As to Mr. Ferrel's explanation of the low barometer at the poles, I must first state that it is not lowest near the poles. In the northern hemisphere, the lowest pressures are near Iceland and near the Aleutian islands, but northwards they are higher, as the observations of Greenland have shown, as is seen also in the prevalence of N.E. winds in winter at Stykkissholm (Northern Iceland); this would indicate that the pressure to the north and north-west of the last place is higher.

The great barometric depressions which so often visit Iceland cannot exist at temperatures of some degrees below freezing point. This explains why the barometer cannot be lower at the Arctic Pole than near Iceland in winter; the temperature there must be certainly much lower, even if the pole be surrounded by open water.

It is the low temperature also that explains the course of the Atlantic storms across European Russia (from N.W. to S.E.), as the winter temperature of Siberia is too low to admit the storms. This was already stated by Mr. Mohn, and I can but confirm his opinion.* In southern latitudes the barometrical depression seems to increase towards the pole, but do we know enough of these regions to say that the lowest barometer will be at the pole? In the highest southern latitudes attained by Sir James Ross the barometer was a little higher than northward. All that we know about the origin and propagation of barometrical depressions gives us the right to say that pressure cannot be lowest at the south pole, but that, as in the northern latitude, the greatest depression will be found at some distance from the pole, perhaps as far as the Antarctic Circle.

St. Petersburg, November 28 A. WOJEIKOFER

Symbols of Acceleration

I WISH to direct the attention of the reviewer of the "New Works on Mechanics," in No. 107 of NATURE, to the following statements which he makes while speaking of Wernicke's book:—"The symbol j is here and throughout the work used to denote an acceleration; for example j x (*sic*) is the acceleration parallel to the axis of x. This notation (unfamiliar to English readers) has obvious advantages when the more appropriate language of the differential calculus cannot be employed."

Now I cannot see how the notation is "infamiliar to English readers," when we have in common use α to denote an acceleration, and α_x an acceleration parallel to the axis of x. Again, though I agree with the reviewer that j_x (or the English α_x) "has obvious advantages when the more appropriate language of the Differential Calculus cannot be employed," yet it should be remembered that there is a more appropriate notation still, viz., that of Newton's Fluxions, recalled to its proper position in mixed mathematics by Sir W. Thomson (see Thomson's and Tate's "Nat. Phil.") and beginning to spread, in which $\frac{d^2 x}{d t^2}$ or an acceleration parallel to the axis of x is denoted by $\ddot{x}$. This notation can be employed at all stages of the student's progress, for it is as easy for him to learn that acceleration parallel to the axis of z, actual acceleration in the path, &c., are denoted by $\ddot{z}$, $\ddot{s}$, &c., as to make himself acquainted with Wernicke's symbols. Afterwards, when studying the Differential Calculus, he may be told the name of the notation, and have his knowledge of it enlarged, but he will never need to unlearn it; on the contrary, he will

* See also my paper "On Barometrical Amplitudes," in the *Journal of the Austrian Meteorological Society*, 1871, No. 10.