ZEISS BUTYRO-REFRACTOMETER: THE CONVERSION OF SCALE-READINGS TO REFRACTIVE INDICES.

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IN the book of directions sent out with the Zeiss butyro-refractometer there is a table showing the refractive index for sodium light corresponding to every tenth degree of the scale of the instrument.

For 0° of the scale the refractive index is 1.4220, and for 100° it is 1.4895.

In a paper by Leach and Lythgoe (*ANALYST*, 1905, **30**, 176) it is pointed out that the change in the refractive index corresponding to a rise of 10° in the scale-reading is less between 90° and 100° than between 0° and 10° .

If, however, the increase of the refractive index per 1° of scale-reading decreases at a uniform rate, it will be possible to express the relation between the refractive index and scale-reading by the formula

$$1000[n]_D = 1422 + ax - bx^2,$$

where $[n]_D$ is the refractive index for sodium light and x is the scale-reading; a and b are constants.

Using the values of $[n]_D$ for 0° , 50° , and 100° on the scale, I find that

$$1000[n]_D = 1422 + 0.817x - 0.00142x^2.$$

Using these values for a and b , I find that the results calculated by the formula agree perfectly with those in the table supplied with the instrument at 10, 30, 40, 60, 80, and 90, and that at 20 and 70 there is a difference of one unit in the fourth place of decimals; from this I think that the formula may be safely used for converting intermediate scale-readings into the corresponding refractive indices.

The following will perhaps be found more convenient for calculation:

$$[n]_D = 1.4220 + 0.00142x \left(.5753 - \frac{x}{1000} \right).$$

DISCUSSION.

Mr. E. R. BOLTON said that by the use of this formula a chart could be constructed from which the figures could be read off without calculation. It could be constructed to read to the fourth decimal place, which probably would not be given very accurately by the slide-rule, while the butyro-refractometer almost gave the fifth place. While referring to this subject he should like to put in a plea for uniformity of temperature in the recording of refractive indices. He had made it a practice not to record a refractive index at any other temperature than 40°C. ; but one found figures obtained at 15° , 20° , 25° , 40° , or 45° .

Mr. ROBERTS said that his object in working out the formula in the first instance had been to provide a ready means of converting readings when a chart had been mislaid—as had happened in his own case.