tute have found it necessary to reinstate the index 6, of Creighton, only modifying Dr Young’s constant multiplier, so as to obtain

F= (0.00333i+1)6 P.

51. It may be useful to collate these formulæ, and for this purpose they are assimilated in notation as follows— F being the elastic force due to a certain temperature *t*.

Robison’s Formula.

Log. Ft = *m t* A.

Prony’s Formula.

Ft = *μ ft + fi ft* 4 *fl ft* + &c B.

*I r n n mm*

Laplace's Formula.

Ft = 0.m76. (10), 0∙°l54547 — <,∙0,000°6258I6ιt.C.

Biot’s Formula.

F, = O’".76. (10)\*\* + b<∙+c<∙ D.

Ivory’s Formula.

F, = 30. (0.0087466f — 0.000015178fβ

+ 0.0000002483i3) E.

Schmidt’s Formula.

F, = fl.ιw + oosιr f.

Soldner’s Formula.

F, = log. 30.13(66a~f) <212ιλ..C.

6 52042.

Roche’s Formula.

F, = 760. 10 H.

11+0.03f

Dr Thomas Young’s Formula,.

F, = (0.00291 + 1)7 1

Creighton’s Formula.

f' = (l⅛) κ∙

Southern’s Formula.

F,=^±⅛iil+0.1 L.

87344,000,000

Tredgold’s Formula.

MST «

Coriolis’ Formula.

F \_ Z001878<+1∖3 333 n

∖ 2.878 )

Commission of the French Academy.

F j =(0.7153Z+l)3 O.

Committee of the Franklin Institute.

F< = (0.00333<+1)6 P.

52. From his earlier experiments Dr Dalton constructed a scale of true temperature, in which the point of freezing mercury is placed at 175°, and in the method he there adopts, the increments of the scale of true temperature are as the square roots of the corresponding expansions of the mercury from its point of maximum density. This scale was soon made the subject of a close experimental scrutiny by Messrs Dulong and Petit, and afterwards of less accurate, though more acrimonious, strictures by Dr Ure.

This scale was, in fact, slightly inaccurate, because it was founded on the comparatively incorrect data of the experimental physics of that date. It is, however, scarcely fair to institute a comparison between the results of a theory based on certain phenomena and the results of experiments which the improvement of our knowledge has entirely altered. It were less unjust to the theory, and more wise as regards the interest of philosophy, first to examine how far it would have been modified by recent discoveries and then to compare its

results with the legitimate consequences of the data on which it rests. It ought also to be recorded, that Dr Dalton published, in the third part of his *Chemical Philosophy* in 1827, the corrected experimental results to which he had been conducted by the improved methods of observation, and the increased experience of thirty years which had elapsed from his first experiments, while modern writers continue to use the old numbers which should have been altogether discarded.

Adopting, then, Dr Dalton’s recent experiments below the point of ebullition of water, and the experiments of the French and American Institutes above that point to 24. atmospheres, let us see what theory the views of Dr Dalton would conduct us to, setting out from these improved data.

Now, Dr Dalton found that, in his experiments, a certain progression of temperatures was accompanied by a certain progression of elastic force ; but his range of experiment being too small, he adopted an erroneous progression, by which, reckoning this progression as rising from the freezing point of mercury, and proceeding as the square roots of the equal expansions of mercury above that point, gave 175° as the point corresponding to the zero of the scale and the origin of his progression.

53. In examining this subject again, I have found that this gradation of temperatures, though not exact in truth, is analogous to one which may be deduced from the best experiments—and equally from Dr Dalton's and those of the French Academy. The law at which I have arrived is this—that if we reckon the temperatures from the point of congelation of mercury in a logarithmic series, the elastic force of steam forms a similar *geome­tric* series to these intervals of temperature. This would indicate that equal intervals of temperature are those which expand the substance of the thermometer through equal fractional parts of its bulk, instead of equi-differential parts as at present, so that, instead of tne common arithmetical series as at present, viz.,

C + rf+2 rf+3 rf+4 rf+ *nd «*

we should have the temperatures represented by the geo metrical series

(C + rf) . (1+dβ + d3+rf4 + .....∕") *β*

and then the corresponding elasticities would be the geometrical series

(F+Λ) . (1 }Λ2 + A3JΛ4J A") y

54. Let us, therefore, endeavour to obtain the values of two such series, so as to coincide with the best experi ments. For this purpose we put the series y into the form

*α mn f* **3**

and the series representing the progression of tempera tures into the form

*÷=p*

r ,r

then since (?)

Log. *a* f log. tn.n = log·/" or making *a* the unit of pressure, for simplicity, we get

n=⅛∕ 1og. *m*

whence by substitution in ε when *q=n,* that is, when the elastic force is that which corresponds to the temperature *q*, we get

\_ 1°K∙∕

r *P* log. *m.......................ζ*

therefore

Log. t = ,°g'P . log. *f+* log. *V «*

and 1°S∙m