II.

In the first place it may be remarked, that, all stations situated on the shore of a lake having the same altitude above sea-level, all the barometric observations taken at those stations may be combined into an average, from which the common altitude may be calculated. Also, if those stations are not all at the same level, but the altitude of each above the level of the lake has been measured or estimated, the barometric pressures observed at the altitudes calculated from them may be reduced to the level of the lake and then averaged, in order to find the most reliable value of the altitude of the lake above sea-level, and then the altitudes of the stations above sea-level are easily obtained.

The same method is applicable, if the differences of the altitudes of the stations have been found by actual levelment.

Further, if the stations are situated along a river, the altitudes will necessarily diminish continuously in the direction of the flow. Hence if the calculated altitudes are taken as ordinates and the corresponding length of the river, measured from a fixed origin, as abscissæ in a system of rectangular coordinates, then the curve drawn through the upper points of the ordinates must necessarily show a uniform slope in the direction of flow. If this be not the case, the curve must be equalised by a proper method in order to satisfy this essential condition. Such an equalisation I have effected simply by joining to averages groups of ten or more ordinates and corresponding abscissæ and then drawing a new curve by means of the average coordinates.

In the case of the river Tarim it was possible to use a more exact method. For Dr. Hedin has made a great many hydrometrical measurements along the course of that river, and in each section thus measured the slope may be calculated by means of a known empirical formula. I have used the following, due to Basin*

$$s = \frac{V_m^2}{r}\left(0.00028 + \frac{0.00035}{r}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where s denotes the slope, i. e. the difference of altitude in the unit of length, V_m the mean velocity of the river,** and r the mean radius or mean hydraulic depth, defined by the formula

$$r = \frac{A}{p} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

A denoting the area of the total section of the river and p the »wet perimeter» of the section, i. e. the length of the curve $AO_1P_1O_2P_2O_3 \ldots O_{n-2}O_{n-1} \ldots B$ formed by the section between the vertical plane and the bottom of the river.*** The value of p was found by measurement on the sketches drawn from Dr. Hedin's hydrometrical data.

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* See for instance G. Tolkmitt, *Grundlagen der Wasserbaukunst*, p. 104—107, Berlin 1898.

** Cfr Sven Hedin, *Scientific Results of a Journey in Central Asia 1899—1902*, vol. I, p. 30. Stockholm 1904.

*** Cfr Sven Hedin, *loc. cit.*, p. 30, fig. 34.