terrestrial temperature), when this determination is to be made from the temperature of flowing springs. Such, at any rate, is the result I have arrived at from my own observations and those of my fellow-travelers in Northern Asia. The temperature of springs, which has become the subject of such continuous physical investigation during the last half century, depends, like the elevation of the line of perpetual snow, on very many simultaneous and deeply-involved causes. It is a function of the temperature of the stratum in which they take their rise, of the specific heat of the soil, and of the quantity and temperature of the meteoric water,* which is itself different from the temperature of the lower strata of the atmosphere, according to the different modes of its origin in rain, snow, or hail.†

Cold springs can only indicate the mean atmospheric tem-

xxxii., s. 270, in the *Voyage dans l'Oural*, p. 382–398, and in the *Edinburgh Journal of Science*, New Series, vol. iv., p. 355. See, also, Kämtz, *Lehrb. der Meteor.*, bd. ii., s. 217; and, on the ascent of the chthonisothermal lines in mountainous districts, Bischof, s. 174–198.

* Leop. v. Buch, in Pogg., *Annalen*, bd. xii., s. 405.

† On the temperature of the drops of rain in Cumana, which fell to 72°, when the temperature of the air shortly before had been 86° and 88°, and during the rain sank to 74°, see my *Relat. Hist.*, t. ii., p. 22. The rain-drops, while falling, change the normal temperature they originally possessed, which depends on the height of the clouds from which they fell, and their heating on their upper surface by the solar rays. The rain-drops, on their first production, have a higher temperature than the surrounding medium in the superior strata of our atmosphere, in consequence of the liberation of their latent heat; and they continue to rise in temperature, since, in falling through lower and warmer strata, vapor is precipitated on them, and they thus increase in size (Bischof, *Wärmelehre des inneren Erdkörpers*, s. 73); but this additional heating is compensated for by evaporation. The cooling of the air by rain (putting out of the question what probably belongs to the electric process in storms) is effected by the drops, which are themselves of lower temperature, in consequence of the cold situation in which they were formed, and bring down with them a portion of the higher colder air, and which finally, by moistening the ground, give rise to evaporation. These are the ordinary relations of the phenomenon. When, as occasionally happens, the rain-drops are warmer than the lower strata of the atmosphere (Humboldt, *Rel. Hist.*, t. iii., p. 513), the cause must probably be sought in higher warmer currents, or in a higher temperature of widely-extended and not very thick clouds, from the action of the sun's rays. How, moreover, the phenomenon of supplementary rainbows, which are explained by the interference of light, is connected with the original and increasing size of the falling drops, and how an optical phenomenon, if we know how to observe it accurately, may enlighten us regarding a meteorological process, according to diversity of zone, has been shown, with much talent and ingenuity, by Arago, in the *Annuaire* for 1836, p. 300.