

MINERAL SPRINGS OF INDIA¹

FOR the first time, a comprehensive report on the mineral springs of India in its various aspects has been presented by Dr. P. K. Ghosh from the presidential chair of the Geology Section of the Indian Science Congress. Mineral springs are of considerable importance in European countries; and at the present time, many of the localities where mineral springs have been noted are centres of flourishing commercial enterprises. Many of these localities in Central Europe have become world famous; and water from such localities is bottled and sold in all parts of the globe on account of its reputed medicinal properties.

Unfortunately in India, except for occasional publications that have appeared on and of, no systematic work has been done. Up-to-date information regarding mineral springs is meagre, although the country is known to possess a large number of natural springs.

Though Sir Thomas Holland had pointed out the importance of the study of mineral springs as early as the commencement of this century, yet, not much work was done till 1939, when Dr. Sir Cyril Fox took up the problem for detailed investigation.

A general study of the geology of the springs in India has shown that they are located in groups along certain definite lines, and these lines correspond with directions of major faults in the area. In limestone areas springs occur in the joint planes and solution channels. Springs in valleys generally indicate the local ground-water level. Again a study of the distribution of these springs in India show certain broad belts to which they are confined, and detailed study has shown that these groups of springs are invariably related to major geological changes that have taken place in India. The following classification shows the intimate relationship that exists between springs and geological structure of the country.

1. (a) Mineral springs of Bihar, which are more or less parallel to the coalfield boundaries; (b) mineral springs of Rajgir area; (c) mineral springs of Monghyr area. These are closely related with the east and west post-Gondwana faults.

2. Mineral springs of west coast of India such as of Ratnagiri, Kolaba, Thana and Surat districts of Bombay.

3. Those of Sind and Baluchistan.

Springs belonging to the above two areas are intimately related with the meridional dislocations during the tertiary period.

4. The mineral springs associated with the Himalayan belt. These are due to local orogenic causes. These conclusions have been

further strengthened by the discovery of zones of crushing and brecciation near sites of mineral springs.

The chemical composition of the spring waters varies according to the nature of the country rock through which it flows. Those found in Archæan terraines are fairly highly radio-emanative and of low mineral content. Those emerging from the basaltic regions are low in radium emanations, but are rich in alkaline earths, sulphate and chloride radicals. Springs emanating from limestone areas are rich in calcium, bicarbonate, carbonate and sulphate radicals.

There are different kinds of springs, some are cold, others are luke-warm and still others are boiling hot. The temperature of these springs have always been constant. The flow of water is generally large during the rains, and meagre during summer. The hot springs do not show much variation. Majority of the cold water springs draw their source of water from the surface collections, but hot water springs are supposed to draw their supply from deeper regions.

Mineral spring waters may be either temporarily or permanently radio-active. The Indian waters investigated are only temporarily radio-active, and this is due to the presence of radon in solution in microscopic quantities derived from the disintegration of radio-active minerals in rocks.

Many of the spring waters are charged with soluble salts in fairly large proportions, and the chief of them are sulphates of magnesium and sodium, bicarbonates and chlorides of alkalies and alkaline earths. Some of them also contain iodides and bromides, and consequently many of them are credited with therapeutic values. A fairly large number of Indian spring waters compare very favourably with foreign waters in composition. The analyses of a large number of Indian spring waters can be grouped as follows.

- (1) Simple waters of low mineral contents.
- (2) Alkaline waters characterised by soda and bicarbonate radicals.
- (3) Sulphur waters charged with H₂S and sulphide and sulphate radicals.
- (4) Chloride or saline water.

In the concluding portion of his address, Dr. P. K. Ghosh has tried to speculate on the source of heat for the hot water springs of India. In so far as these springs of C.P. and Bihar are concerned, he has made the suggestion that the juvenile waters associated with the latest phase of the igneous activity, namely, the Deccan trap, may be the possible source. Though other alternatives are considered, it is presumed that the main source of the heat must be the juvenile waters associated in such large quantities with the magma chambers in the deeper portions of the Earth.

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¹ Presidential Address of Dr. P. K. Ghosh to the Geology Section of the Indian Science Congress, Patna, 1948.