ix the physiological traits through controlled breeding programme. Studies on the correlation between Hb type and certain economic characteristic (fertility, growth and fleece weight) are in progress.

My thanks are due to Dr. A. Roy for guidance.

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ON BLACK SAND CONCENTRATES

The voluminous black sand concentrates (BSC) in beach sands along the East and West coasts of India, in a series of local concentrations, at favourable localities, constitute a thorium asset of world importance. The geological occurrences of the minerals of the BSC are usually found in granites, gneisses, pegmatites and such other rock types of crystalline complex of Archaean age, which occur between the projected base of the Deccan Traps and the present land surface. These accumulations of economically important heavy minerals, some of which are radioactive, have been formed by destruction of the pre-existing rocks and are carried away by running water, ultimately joining the beach sands so that they are sporadically distributed. After repeated sorting by the action of running water, wave, tide or wind, the heavy black sands along with the radioactive resistates are separated at some favourable localities forming beach placers. As they were thus the predominant constituents of phaneritic crystalline source rocks, they are the stable primary detritals in sand size.

However, the fractionation by mechanical separation is commonly imperfect and hence there will be a gradation in grain size with a corresponding gradation in both chemical and mineralogical composition, which is expected to be reflected in distribution of radioactivity in different fractions of BSC. In order to elucidate this, the BSC collected from Nagerkolil, Madras State, has been chosen. The $\beta$-activity of different naturally-occurring fractions of the BSC, which have been made free from magnetic material, has been determined with a Geiger-Muller Counting System (supplied by the Atomic Energy Establishment, Trombay), consisting of Utility Scaler (Type DS 4110, Preset Timer Type ET 450), and the Geiger-Muller tube (Type I 1030) which is of end-window type with a wall thickness of 3 mg/cm.$^2$ and operating voltage of 1,275 V. The percentage of equivalent $U_3O_8$ of each sample has been determined from the $\beta$-activity index, by calibrating the G.M. counting system with NBL standard sample of pitchblende mixed with dunite, following the method of Nininger (1956). The results are tabulated in Table I.

### Table I

<table>
<thead>
<tr>
<th>Serial NO.</th>
<th>Grain size in microns</th>
<th>Counts per minute</th>
<th>Radioactivity ($\beta$-activity) per cent. $U_3O_8$ $\epsilon$g</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500-231</td>
<td>50</td>
<td>0.0024</td>
</tr>
<tr>
<td>2</td>
<td>231-178</td>
<td>92</td>
<td>0.0044</td>
</tr>
<tr>
<td>3</td>
<td>178-152</td>
<td>113</td>
<td>0.0049</td>
</tr>
<tr>
<td>4</td>
<td>152-124</td>
<td>152</td>
<td>0.0073</td>
</tr>
<tr>
<td>5</td>
<td>124-89</td>
<td>874</td>
<td>0.0417</td>
</tr>
<tr>
<td>6</td>
<td>89-76</td>
<td>993</td>
<td>0.0474</td>
</tr>
</tbody>
</table>

From Table I it is clear that the same sample of BSC does not have a uniform value of $\beta$-activity but shows, very strikingly, a progressive increase towards finer-sized fractions indicating that the radioactivity increases with the decrease in grain size. As might be expected from a study of the relation between the grain size of sediments and their chemical and mineralogical composition, a close correlation between grain size and radioactivity has been established in the present study. The BSC, which is a product of large-scale chemical and mechanical fractionation processes, is in fact concentrate, sharply contrasted with respect to the distribution of radioactivity in different size fractions.

Grateful thanks are due to Prof. M. G. Chakrapani Naidu for many helpful suggestions.

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