of environmental (i.e. culture) conditions. It is therefore difficult to treat these diversifying races being either as sympatric or allopatric or even parapatric. Hence, a new term namely ‘allo-sympathy’ is suggested for such an assemblage of populations. We strongly believe that this new term will have implications for sympatric models of speciation which envisage different scenarios such as disruptive selection and assortative mating, to avoid exchange of genes between different populations which are apparently sympatric in distribution.


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On the discovery of uranium mineralization in Wahkyn Area, West Khasi Hills district, Meghalaya, India

India's largest sandstone-type uranium deposit at Domiasiat1–2, containing about 9500 t of oxide at an average grade of 0.1% U3O8, was discovered by systematic multidisciplinary investigations in the Upper Cretaceous Mahadek sandstones of the Meghalaya plateau by the Atomic Minerals Division (AMD). On the basis of photogeological studies, a few patches of uraniumiferous Mahadek sandstone were located near the confl uence of the Wahnhej and Kyuni rivers3–5. Regular radiometric checking in the area, about 12 km WSW of Domiasiat, picked up significant uranium mineralization, assaying more than 11% U3O8, in the Lower Mahadek sediments which are exposed on both sides of the Wahnhej and Kyuni rivers, henceforth termed Wahkyn area. This note describes some salient features of the investigated uranium mineralization in this area.

Wahkyn area lies 160 km SW of Shillong and about 5 km NE of Kulong village, West Khasi Hills district. The area is approachable by 140 km long PWD road and 20 km stretch of forest track. The radioactive rock exposures are, however, located in the deep interior of the thick forest, being accessible only through a 5 km long foot track. The terrain is rugged, inhospitable, and the logistics and other infrastructural facilities available are still very poor. The area falls on the southern fringe of the Meghalaya plateau that displays erosional landforms by the Kyuni, Wahnhej and Jadukata river system, exposing a thick sequence of Cretaceous–Tertiary sediments overlying the Precambrian basement that comprises of gneisses and migmatites with pegmatitic and granite injections. While the Cretaceous sediments are exposed in the valleys and gorges, the coal- and limestone-bearing Tertiary rocks form the high plateau. The Cretaceous Mahadek sediments have been divided into Upper and Lower divisions on the basis of their sedimentological and geological characteristics6. The 30–60 m thick Lower Mahadek sequence commences with the basal conglomerate unit which is overlain by grey, arkosic sandstone that shows medium- and small-scale cross bedding, ripple cross lamination, scour and fill structure, and fining upward sequence, each unit commencing with pebbly sandstone on an erosional base and ending with fine-grained sandstone, siltstone or shale at the top. Presence of such primary sedimentological features suggest that these sediments were deposited in proximal braided river channels and bars. The channel sediments are in turn covered by medium to coarse felspathic sandstones.
with large tabular cross-bedding and thick silty shale. These sediments are characterized by mottled texture, flaser and lenticular bedding, parallel and small-scale ripple cross lamination and hummocky and herringbone cross-stratification, all indicating tidal and wave influence. The Upper Mahadek sediments, consisting of purple sandstone with few pebbles and drab green to purple shale, conformably overlie the Lower Mahadek Formation.

The Wabbi river practically divides the area into two blocks: North and South. Detailed radiometric checking followed by channel sampling and radiometric logging of the outcrop faces reveal that the major surface anomalies are clustered in seven blocks within an area of about 15 km² as shown in Figure 1. Major anomalies in the Wahkyn and Wahkut blocks are given in Table 1.

The main features of the Wahkyn area are typical of sandstone-type uranium deposits. The uranium mineralization in the area is confined to proximal braided channel and bar sediments. The sand bodies with ore-grade mineralization demarcated at 0.02% U₃O₈ cut-off are large lenticular peneconcordant masses disposed in an en echelon pattern. They occur 5–10 m above the basement and dip gently parallel to the basement slope (Figure 2). The host rock is poorly sorted, immature, grey, medium to coarse-grained subarkose and arkose. The major clasts are of quartz and felspar with lesser extent of rock fragments, biotite and muscovite. Zircon, sphene, ilmenite, rutile, goethite, magnetite, hematite, limonite and apatite are accessory minerals. Framboidal pyrite, kaolinite and carbonaceous matters are noticed within the siliceous matrix and as cementing material.

Carbonaceous matter occurring in various forms such as disseminations and lumps, cementing material, fracture fillings and stringers, and pyrite, apparently control the mineralization. The primary uranium minerals are uraninite and pitchblende, which occur as filling of pore spaces and cavities in the host rocks and coal, and as adsorbed on clayey and carbonaceous matter. The surface samples show disequilibrium in favour of daughters except in the places having high content of organic matter. This may be because all the anomalies are exposed along stream sections, always at contact with water, resulting in partial leaching of uranium.

![Geological map of Wahkyn area, West Khasi Hills, Meghalaya.](image)

**Table 1. Major anomalies located in Wahkyn area**

<table>
<thead>
<tr>
<th>Block/anomaly</th>
<th>Dimensions (length (m))</th>
<th>at 0.02% U₃O₈ thickness (mm)</th>
<th>Av. gr. (%U₃O₈)</th>
<th>No. of samples</th>
<th>Range of assay values (%U₃O₈)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wahkyn South Block 1</td>
<td>200</td>
<td>3.4</td>
<td>0.075</td>
<td>85</td>
<td>0.014–4.10</td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>2.3</td>
<td>0.073</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Wahkyn North Block 3</td>
<td>60</td>
<td>1.7</td>
<td>0.039</td>
<td>24</td>
<td>0.008–0.12</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>1.4</td>
<td>0.046</td>
<td>15</td>
<td>0.011–0.11</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>1.3</td>
<td>0.041</td>
<td>13</td>
<td>0.009–0.28</td>
</tr>
<tr>
<td>Wahkut Block</td>
<td>25</td>
<td>2.8</td>
<td>0.114</td>
<td>11</td>
<td>0.007–3.80</td>
</tr>
</tbody>
</table>
Figure 2. Correlation of the mineralized faces, Wahkyn South Block, Wahkyn area, West Khasi Hills, Meghalaya.

Wahkyn area is presently under active subsurface exploration pursuing a three-tier drilling programme: exploratory, reconnaissance, and stratigraphic. Exploratory boreholes are being drilled in the Wahkyn North and South blocks along both banks of the Wahblei river to establish subsurface continuity of the mineralization and to prove the reserves. Data from some of the boreholes are very encouraging and indicate the possibility of defining an ore body comparable to that of the Domiasiat area. Reconnaissance and stratigraphic drilling being carried out in the surrounding areas, covered by the Upper Mahadek sediments and in the southern plateau region, have also encountered uraniumiferous Lower Mahadek sediments at depth, and these blocks will be developed by exploratory drilling in future.


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First occurrence of araucaroid wood from Pondicherry Formation (Late Cretaceous), Pondicherry, South India

Arucaria (the monkey puzzle tree) is at present restricted to New Caledonia, New Guinea, eastern Australia, Chile—Argentina, Cordillera and Brazil1-2. Fossils, attributed to Arucaria (wood, cone, and pollen grains3-9) are however, known from Mesozoic sediments of northern and southern hemispheres. In India most of the araucaroid fossil woods described so far are from the Deccan Intertrappean sediments (Late Cretaceous-?), though one wood has also been reported from Neogene rocks of West Bengal10-12.

The small piece of fossil wood (10 cm long and 4 cm broad) was collected from 3 km north of Pondicherry (79°45' Long. and 12°1' Lat.) on the way to Auroville by unmetalled road. The strata from which the fossil was collected, according to Sastri et al.5, belong to Pondicherry Formation. The Pondicherry Formation in Cauvery basin (Figure 1) occurs between the Upper Ariyalur (Late Cretaceous) at the base and Eocene rocks at the top, and both are unconformable with the Pondicherry Formation. This formation is roughly 230 m thick and comprises shale, sandstone and limestone. The sandstone is coarse, loose and yellowish. The fossil wood was collected from this unit. Banerji14 on the basis of foraminifera assigned a Late Cretaceous age to this formation.

The collected fossil wood is nonporous with distinct growth rings forming prominent zones and is separated by a band of wood tracheids. The early wood zone is roughly 300-400 X100 µm thick, the rays in transverse section are 3-7 tracheid cells apart. Tracheids are nearly 6-7 mm², and more or less polygonal in shape. Rays are 15-20 per mm², 2-30 cells high, and filled with dark substance.

Ray parenchyma cells are absent. Pits are present on tangential walls of the tracheids, and are 5-10 µm in diameter, and the walls of the tracheids have 1-2 alternate pits. Wood parenchyma has not been observed. Cross field pits in the radial walls are circular, generally one in each cell. Resinous canals are absent (Figure 2).

The fossil wood described here closely resembles Araucariaian keri-