The divergence of the radiation force at $r=2M$ must be treated with caution. Lindquist *et al.*[8] show that the region inside $r=2M$ is unphysical. In addition, it would seem difficult to establish initial conditions that could lead to such a powerful outflow of radiation as is found at $r \gtrsim 2M$. Therefore, the more plausible applications may be where $4\pi GMm$ exceeds $L\sigma$ by a few per cent, and stabilization occurs at five to a hundred times r_s, where $r_s=2GM/c^2$. This could lead to a small gravitational component to the emission redshift in QSOs and could lead to absorption redshifts different by a few per cent from the emission redshift, as is sometimes observed, if the opacities of the emission and absorption regions are in the proper relation.

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First Millenium BC Transport of Obsidian from New Britain to the Solomon Islands

DURING recent archaeological work in New Guinea and the British Solomon Islands we have recovered simple flake artefacts of obsidian associated with a distinctively decorated pottery known as Lapita ware[1]. This ware had a wide distribution across the south-west Pacific in the first millenium BC, and is known archaeologically from Watom Island, near Rabaul in New Britain, to Tonga, some 4,000 km to the south-west.

Table 1 Results of the Ambitle and Gawa Obsidian Determinations Compared with the Talasea Source

	Ambitle site	Gawa site	Talasea source[4]
Sr (p.p.m.)	220	250	250
Zr (p.p.m.)	160	155	140
Ba (p.p.m.)	590	590	740
Cu (p.p.m.)	6.2	6.0	5
Mn (p.p.m.)	430	480	490
Mg (%)	0.13	0.15	0.12
Fe (%)	0.88	0.90	0.91
Ti (%)	0.15	0.15	0.15
Ca (%)	0.92	0.94	0.94

Obsidian flakes from the two sites of Ambitle, off New Ireland, and Gawa, in the main Reef Islands of the Santa Cruz group, were analysed by emission spectrography for nine elements, Sr, Zr, Ba, Cu, Mn, Mg, Fe, Ti and Ca. We chose these to conform to earlier determinations on samples from the five known geological sources in the region[2,3], so that comparisons could be made with the known data.

The results of the determinations (Table 1 and Fig. 1) show that the Ambitle Island and Gawa Island archaeological obsidian samples are indistinguishable, and are therefore from a common source. The closest correspondence of these samples to any of the known geological sources is with the obsidian from Talasea on the Willaumez Peninsula of New Britain. We concluded that Talasea obsidian was the raw material for the Ambitle and Gawa artefacts.

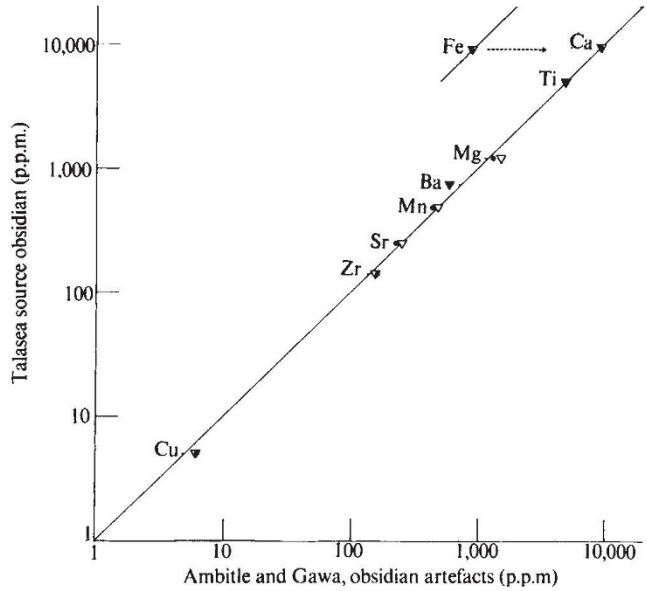

Fig. 1 The relative concentration of nine elements for the Ambitle sample (●), and the Gawa sample (▽), are practically identical. Their very close approximation to the values of elements in the Talasea source is indicated by their small horizontal distance from the diagonal, which is the line marking equal composition.

Key[2] demonstrated that the Talasea source provided the obsidian for the Watom Island Lapita site, which involves transport of roughly 270 km from the source. The distance from Talasea to the Ambitle site is roughly 500 km and to the Gawa site roughly 2,000 km. The ^{14}C dates for the Gawa site are 1005 BC $\pm$ 95 (I 5747) and 825 BC $\pm$ 100 (I 5748).

Thus the data underline the effective sea-faring ability of the regions' earliest pottery manufacturers who were capable of transporting materials over long distances up to 3,000 yr ago.

The spectrographic determinations were made by Mrs M. J. Kaye of the Geology Department, Australian National University, using the procedures of Ahrens and Taylor[4].

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