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POSSIBLE WESTERN OUTLET FOR AN ANCIENT MURRAY RIVER IN SOUTH AUSTRALIA: A DISCUSSION

by

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Possible Western Outlet for an Ancient Murray River in South Australia: A discussion.

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In a recent paper Williams and Goode (1978) proposed that the ancestral Murray River in South Australia debouched into Spencer Gulf in the region of the mouth of the River Broughton, just south of Port Pirie, during the Eocene and/or late Middle to Upper Miocene. We dissent from this view point and suggest that there are alternative explanations for the features observed.

We feel that the term "ancestral" as used by Williams and Goode for their Eocene "Murray River" is inappropriate and misleading as "the time of origin of a river system is defined as the earliest date at which a continuing, persistent river occupied the region" (Mann and Thomas, 1968). However, Potter (1978) notes that some river systems can be remarkably persistent despite major interruptions.

The marine transgressions across the Murray Basin, which began in the Late Eocene and blanketed out any possibility of a continuing 'ancestral Murray River', did not effectively conclude until deposition of the widespread marginal-marine Loxton Sands in the Early Pliocene. The first available time slot for an ancestral Murray is thus the middle Pliocene, approx. 3 Ma, as proposed by Twidale et al., (1978).

Semantics aside, there are compelling geological reasons why an outlet for the Murray River in the region of Spencer Gulf is improbable.

A. Central to the argument is the age of the sediments comprising the "Broughton delta". Recent drilling in this area by the BMR (BMR Record 1978/89) and by North Broken Hill Ltd intersected mid-Miocene limestones correlated with upper Melton Limestone which outcrops to the south at Webling Point and directly across Spencer Gulf at Deep Creek and along the Randell Fault Scarp just south of Whyalla (Lindsay, 1970). This shelf facies corresponding to upper Nullarbor Limestone, occurs at several localities around Eyre Peninsula and across northern Yorke Peninsula. It was once widespread but has since been greatly dissected. In the region of the "delta" the Melton Limestone is overlain to our knowledge only by Pleistocene non-marine clay and sand and late Quaternary marginal-marine units. Thus we believe that the sediments comprising the structure described by Williams and Goode as the "Broughton delta" are of Pleistocene and Holocene age and rest in part on thin shelf limestone of mid-Miocene age. The bulk of the sediments appear to be related to alluvial fan type deposits that characterised the flanks of the ranges during the Pleistocene.

B. The Eocene sediments in the Port Pirie bore are fluviatile and are part of the sediment fill of the Pirie - Torrens and St. Vincent grabens which had an outlet to the south in the region of Port Wakefield where indeed deltaic facies were deposited. But these sediments are related to a major north-south system whose origins were north of Lake Torrens.

The other clastic and dominantly fluviatile sediments of the Condowie Plain are more precisely dated as Oligo-Miocene. They clearly predate Melton Limestone and cannot therefore be related to sediments of the "Broughton delta". They are not even lithologically comparable.

During the Eocene the climate was at least sub-tropical with rainfall in excess of 1000 mm p.a. and before the marine transgression the Murray Basin was being drained, like most basins of southern Australia, by numerous streams. From the Murray Basin these found their way through and around the Padthaway Ridge. One major stream flowed south through the Langhorne Creek region around the north - western end of the Ridge and another, probably larger, flowed into the Gambier Embayment south of Naracoorte contributing to the thick packet of clastic sediments in the Otway Basin. At no time during the Tertiary did the Padthaway Ridge prevent the movement of water or sediment southward.

C. The geological evidence suggests that uplift of the ancestral Mt. Lofty Ranges occurred at various times in the Cainozoic, commencing probably early in the Paleocene (Twidale et. al., 1978) since gravelly fluviatile deposits at least as old as middle Paleocene and derived from the erosion of rejuvenated highlands are encountered at depth in the western Murray Basin (Harris in Lindsay and Bonnett, 1973). Contrary to the impression given by Williams and Goode, Webb (1958) had earlier stated that 'the old land surface of the Mount Lofty Ranges commenced to rise' early in the Tertiary, not in the Upper Miocene. The separation of the Murray and St. Vincent - Pirie/Torrens Basins is implicit in the sedimentary record since the early Tertiary. Not only in the Pleistocene, but, through the entire Cainozoic, the Mt. Lofty - Flinders Ranges formed a major barrier.

D. There is no evidence of the supposed antecedence suggested and there are alternative explanations of the curious course of the Murray River at Norwest Bend, such as captured or structural control. (Twidale et. al., 1978).

E. The other time slot favoured by Williams and Goode is late Middle and Upper Miocene and this is a time in both the

St. Vincent and Murray Basins when there is little if any recorded sedimentation either marine or non-marine. In any event transgression of the Bookpurnong Beds (possibly uppermost Miocene) would have blanketed at least the eastern part of the area once again. The evidence of "Miocene" sediments occuring beneath the Condowie Plains has been dealt with earlier and these sediments are clearly much older.

Even during periods of emergence in the Murray Basin during the Late Cainozoic the nature of the sedimentary sequences laid down there make it unlikely that any large surface flows would be generated. The sequences are mainly calcareous, and then, as now, drainage would be generally cryptoreic or underground. These subsurface flows would gravitate to the lowest underground outlets which would have been, again then as now, to the south over the Padthaway Ridge and not westwards through the Adelaide Geosyncline belt of folded sediments.

There are other points in their paper which require correction or explanation.

1. They talk of the Boughton River being underfit without really understanding what the term implies. They present no evidence that the geometry of the river curves of the Broughton differs from that of the valley. Underfitness does not merely mean that a small river runs in a large valley: there is no anomaly in that, for given time a small volume stream can excavate a large valley.
2. The size of the delta is also irrelevant, for its size vis à vis the river is surely dependent on the nature of the sediments transported, as well as their volume, and also on whether coastal conditions are suitable for immediate deposition. There are many many large rivers with no delta, and small rivers with definite deltas.

3. The contention that "Australia possesses no large coastal delta" is difficult to understand when the Burdekin and Ord River deltas are listed amongst the worlds largest (Coleman and Wright, 1975).

4. Williams and Goode cite the presence of Koolunga Gravel in the region of the Broughton "delta" as evidence but these and lithologically similar sediments of Eocene and Miocene age are widely distributed in small meridionally elongate basins such as the Walloway, Willochra, Barossa and Meadows throughout the length of the Mt. Lofty and lower Flinders Ranges.

In summary we agree that the channels of the Broughton, the Burra and the Murray (between Loxton and Norwest Bend) are structurally controlled, and are aligned with prominent lineaments, some of which cross the Flinders and Mt. Lofty ranges. We also see evidence for "ancestral" river systems draining the catchment of the Great Dividing Range in the east as early as the Eocene (e.g. Macumber 1978) and the Mt. Lofty - Olary areas in the west and north as early as the mid Paleocene, but we cannot accept the hypothesis that these systems at any time crossed the Mt. Lofty ranges to the Spencer Gulf region. The geological evidence from Tertiary palaeogeography and from the most probable age of the sediments of the Broughton "delta" makes this unlikely.

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