TROPICAL RIVERS AND GEOMORPHOLOGY

"Now I hold it is not decent for a scientific gent
To say another is an ass — at least, to all intent;
Nor should the individual who happens to be meant
Reply by heaving rocks at him to any great extent."

BRET HARTE

Plain language from Truthful James

So I shall refrain from throwing rocks at Professor TRICART, even though his diatribe is arrogant and personally offensive. Of his general points I wish only to point out that his objection to the terms "tropical" and geomorphology is mere word play, and his command of English is certainly good enough to understand that though he may use a different phrase in French, in English it becomes "tropical geomorphology". His own book, "Le modelé des régions chaudes, forêts et savanes" is entitled in English "Landforms of the humid tropics..." which means precisely "tropical geomorphology." More recently he has contributed a chapter to a book entitled "Environmental Change and Tropical Geomorphology" (DOUGLAS and SPENCER, 1985) so presumably he knows what "tropical geomorphology" means. In English the term "tropical" is commonly used as a verbal short-hand for "inter--tropical". Thus, when we write of "tropical rain forest" we mean forest that grows in

wet tropical regions, not the (non-existent) forest that grows in deserts at the latitudes of the tropics.

TRICART is right in saying that structural, dynamic and climatic geomorphology are all part of the same reality: I am unlikely to forget it, being the author of "Tectonics and Landforms" (available in English and Russian, but not in French). However, it is not necessary to talk about all aspects of a subject all the time: sometimes we want to talk of one topic, sometimes another. TRICART and CAILLEUX, for example, concentrate on climatic geomorphology in their book "Introduction to Climatic Geomorphology" (Longman, 1972).

There is only one question of fact in TRICARTs exposition: do some tropical rivers carry a load of coarse debris? TRICART evidently still believes they *do not,* so it worth stressing that in the opinion of others they *do!*

I suspect he is unhappy that I only quoted French writers for the view that tropical rivers have little bedload because of extensive weathering. He may be relieved to know that the same error occurs in English literature. TWIDALE (1976, p.273), for example, wrote:

"In the humid tropical regions... Chemical weathering is rapid and intense. Few fragments of a size greater than sand survive weathering. The rivers lack... the tools to abrade the bed and banks..."

THOMAS (1974) wrote "...the rivers may carry only fine gravel, sand and suspended clay particles, with an almost total absence of coarse bedload. Under such conditions erosion by tropical streams is relatively feeble..."

But many tropical rivers carry a coarse bedload. LOFFLER (1977) writes:

"Fluvial erosion is undoubtedly the most important process operating in the mountainous landscape of Papua New Guinea... The rivers contain large amounts of coarse gravel and boulders which travel considerable distances downstream. In the Strickland, for example, coarse gravel, mainly quartzite and limestone, forming extensive gravel banks and bars, is to be found up to 100 km downstream from where the stream leaves the mountains. Similar observations are reported by SPEIGHT (1965) from the Angabunga River, Papua, and LOFFLER (1972) from the Pual River, Vanimo area".

"The calibre of the bedload is also truly impressive. Boulders of several cubic metres have been observed by the author in numerous large rivers... in many instances the source area has been found to be many kilometres upstream".

"The difference between humid tropical rivers and extratropical rivers appears to be more a matter of degree than of kind and is largely a result of the higher run-off associated with this climatic zone".

The argument is presented further by DOUGLAS and SPENCER (1985, p. 65-68) who quote several specific instances of coarse bedload in tropical rivers. In Surinam, BAKKER (1957) noted that the erosive action of the river broke fragments of rock away from the bed of the channel. In the Amazon headwaters pebbles up to 50 cm in diameter are moved by major floods. These include grey granites and limestone. BIROT himself noted stream channels in Puerto Rico with large quantities of pebbles,

some over 50 cm in diameter. Malaysian rivers in their headwaters have much gravel in their beds... even well down the courses of major rivers, substantial quantities of gravel occur.

Perhaps TRICART would argue that all these instances may be weathering products, or landslide deposits. Are there no good observers except himself? Research by debate may have its uses, but to get anywhere in argument the factual evidence for another point of view should not be belittled, or ignored.

An alternative view of tropical river geomorphology is simply stated by FANIRAN and JEJE (1983) who write "...many tropical rivers... flow... directly on bedrock, while the depth of the weathered rock increases with distance from such channels to the water divide..." A similar situation was described from Puerto Rico, where BIROT (1970) noted that the rivers have cut down to bedrock along practically their entire length. The pebbles come from the bed rather than from the slopes.

PAIN and OLLIER (1981) described a similar situation from Fergusson Island, with straight slopes covered in regolith, but streams on bedrock. In geological surveying in Papua New Guinea the strategy is to follow streams, where bedrock is revealed, rather than slopes or ridges which are usually covered in regolith.

Let LOFFLER have the last word:

"The transport of material in these tropical rivers does not... appear to be fundamentally different from that in extratropical areas as often claimed by climatic geomorphologists (BUDEL, 1972: BREMER, 1971, 1972). There is no evidence to suggest that rivers in the tropics erode their beds more by solution processes than by physical corrasion by the bedload. This applies not only to the streams and rivers in the mountain areas but also to those in the lowlands".

C.D. OLLIER

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