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REPLY

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It is difficult to understand the criticism expressed by Julian Ash because our findings do not depend so much on precise dates for the formation of the stem. He gives no argument why our statement that "there was no diffuse secondary growth over the entire mature stem during the last 25 years of growth, with the exception of a restricted zone in the center at medium height" may be wrong.

The rise in ^{14}C above 15m and the almost complete absence of excess ^{14}C below that height are so drastic that it seems justified to maintain our original conclusion.

Ash questions "whether the observed dramatic rise in $\Delta^{14}C$ levels above 15m height is simply recording the contemporary changes in atmospheric $\Delta^{14}C$, or whether there has been transport of more recent carbon to lower parts of the stem which may have undergone secondary thickening."

The main problem seems to be the term "secondary thickening" which should not be applied to growth of cells which originate from the primary apical meristem.

Surely, the formation of new wood in palms may last some years until it becomes mature. The terms "mature" and "immature" are open for discussion, but may be defined easily by means of the incorporation or not of recent photosynthetic products as traced, eg, by radiocarbon. As we found a sharp limit of enhanced ^{14}C activity, which proves the viability of this definition, all growth of the stem has to be considered primary in nature. In a group of palms the maturation is a long-lasting process; according to Waterhouse and Quinn (1978) it should be termed, "sustained primary growth."

It is unrealistic and contradictory to experience to paint a picture in which the palm ceased to grow in height, say 20 years before it was cut, but continued to grow in width. A palm that stops growing taller is already dying—the normal flowering and fructification implies the formation of new axillary buds and, thus, new leaves and wood.

We have no clear indication of the time span of formation of the wood in *Cocos nucifera,* but we expect a figure of about five years, coinciding more or less with the mean life of an individual leaf (Child, 1974); the bulk of the tissue should form, however, in a much shorter interval.

The main doubt about diffuse secondary growth still originates from the high ^{14}C activity found at 9.4m which shows that there is the possibility of incorporation of new photosynthates into old tissue. We suggested that "it may be that the stem undergoes at a certain age a distinct modification in the center, only then assuming its final state. This zone may be correlated with the formation of the hard peripheral sclerotic zone composed of congested, dark vascular bundles and ground parenchymatic tissue." If so, then the old trunk at any height may be a mixture of photosynthates of different ages. But we want to point out that there is another possibility to explain the high activity at 9.4m. Higher up in the trunk there were injuries caused by insects and the high ^{14}C level may be due to a response of the

plant in order to re-establish the continuity of the bundles. This would also explain why the high $\Delta^{14}C$ value was found only in a very restricted zone.

We agree with Ash that the base of the stem is evidently a zone for (diffuse) secondary growth because adventitious roots are continually produced from the base of the stem (Child, 1974). However, the criticism by Ash about the description of the trunk does not hold because he gives an exact figure of the stem, apparently derived from our Figure 2, which shows the dimensions of the stem. Thus, the stem was not totally cylindrical; only the main part was almost cylindrical.

We agree that there are still many questions that could well be investigated by means of ^{14}C measurements, taking advantage of the unique radiocarbon situation due to atmospheric nuclear weapon tests.