In 1976 Martin Hall, then a young student just out from England, used the disc of a yellowwood tree (Podocarpus) housed in the Natal Museum to work out climate changes through time. He sanded the disc then counted and measured the rings, developing a graph from which he extrapolated how the climate had changed from the end of the 13th century until the tree was felled in 1905. Martin’s approach to dendrochronology was much the same as many others. I can very clearly see myself as a young boy asking my father to count the rings of a felled pine tree in Wyndberg Park and tell me how old it was. Lucky for Ronald February it was an exotic and not an indigenous tree and he was able to count the rings through time. Lucky for me too because after that I was hooked and many years later, I am still counting tree rings. However, was this luck or misinformation?

Southern African governments are increasingly aware of the effects of droughts on rural communities. Drought management and forward planning are however, hampered without long records of rainfall change. Compared to the Northern Hemisphere, the Southern Hemisphere has very few records, and South Africa has no good rainfall records more than 100 years old. In the Northern Hemisphere, dendrochronology provides a climate record going back thousands of years. Down south, tree ring records from South America have proved useful for almost 4000 years of climate reconstruction with similar results coming from Tasmania and New Zealand. In South Africa, however, few trees show any dendrochronological potential. Since that first study by Martin Hall a number of researches have focused their attention on the various southern African yellowwoods and cedars (Widdringtonia). Tree ring research was developed in the United States by Edward Douglass on Ponderosa pine (Pinus Ponderosa), and as cedars and yellowwoods are also gymnosperms, South African research focused on these species.

Tree ring research is an exact science. It is not merely about counting the number of rings in one circumstance, measuring the width of these rings then developing a graph that can be related to climate. Moving inward from a precisely dated outer ring each successive annual ring is assigned to the exact year in which it was formed. A combined chronology from 20 to 30 precisely dated trees is developed.

The rings from the individual trees are matched through variations in width due to climate variables. Marker years with exceptional divergence in ring width are matched up on more than one radii within a tree and also between trees to corroborate dating (‘cross dating’). The ring width measures of the 20 to 30 trees from the same locality are combined to form a single chronology, which is related to available climate records to form the basis for climate reconstruction.

In South Africa only two studies have worked out true ring width index chronologies related to meteorological records. Both of them have been on the Clanwilliam Cedar from the Cederberg Mountains in the Western Cape. Unfortunately the lack of rainfall records going back beyond historic times, and the need to relate the tree-ring chronology to climate variables, makes them statistically insignificant. Basically the trees tend to grow with their feet in water and although they put on a ring each year, the width of this ring is not significantly related to either temperature or rainfall. This does mean that cedar trees can be accurately aged even though there is little climatic information available from them.

For more than twenty years now South African researchers have concentrated on Podocarpus species, yet the two studies mentioned above on Widdringtonia are the only two that have been successful. The reason for this is because South African woody species present more dendrochronological problems than any woody species in the Southern Hemisphere! Some species (like the protea) show no ring boundaries - even in microscopic section. In others, rings are not clearly defined, form several rings annually or are insensitive to climate change. Although Martin Hall’s tree from the Natal Museum represents the longest available tree ring sequence for South Africa, concerted efforts by Peter Tyson and the Climatology Research Group at the University of Witwatersrand have not provided any corroborative series. This is because of difficulties with the rings of yellowwoods - a lack of definition in the rings, lobate growth and ‘wedging out’ of rings. Even when using whole discs of trees, rather than cores, it is not possible to regularly trace a ring around the full diameter of a tree, thereby making the two basic tenets of dendrochronology, cross-dating and chronology development, an impossible task.

Much work has gone into the development of dendrochronology in South Africa, and although the results have not been encouraging, research efforts should focus on other species from the more arid parts of the country where water availability is the major limitation to growth.

Loft: The author and a Nature Conservation Officer collecting cores from cedar trees in the Cederberg.

Below left: Problem tree. A cross section of a small Podocarpus latifolius showing lobate (as opposed to circular) ring growth, ‘wedging out’ of rings and poor ring definition.

Below: How tree rings are cross dated.