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100 years ago

Mr Johnston was early in 1884 specially commissioned by the Royal Society and the British Association to study the interesting fauna and flora of the Kilima-Njaro uplands. During the six months from May to October of that year, this experienced African traveller has succeeded under great difficulty in collecting abundant materials for illustrating the natural history and physical constitution of the "Mountain of the Snow Fiend," as its euphonious Ki-Swahili name is interpreted. These results are embodied in the work before us, which is alike admirable for its bright and graphic style, and the judicious arrangement of its varied contents. By the simple plan, consistently adhered to throughout, of treating the narrative portion separately, and confining the strictly scientific matter to the concluding chapters, all tastes are consulted, and the common mistake is avoided of sacrificing the interests of the student to those of the general reader: "The Kilima-Njaro Expedition, a Record of Scientific Exploration in Eastern Equatorial Africa." By H.H. Johnson, F.Z.S. (London: Kegan Paul, 1886).

Amongst the valuable animal specimens secured was one of the new and beautiful species of Colobus (*C. guereza*, Rüpp., *var. caudatus*, var. nov.) first seen and described by Mr. Thomson, which frequents the base of Kilima-Njaro, and is apparently restricted to that region. Mr. Oldfield Thomas tells us that it is "characterised by having the white brush of the tail very much larger and finer than is the case in the true Abyssinian *C. guereza*. . . . "
From *Nature* **33** 322, 4 February 1886.

Biological rhythms

Sleep researchers caught napping

from N. Mrosovsky

Minima in body-temperature rhythms usually occur towards the end of each night's sleep. When people live in constant conditions, without information about the time of day, sleep and temperature rhythms can become desynchronized. Initially, both rhythms free-run together with a circadian period of about 25 hours and then, in some subjects, the period of the sleep rhythm suddenly lengthens to a value near to 30 hours while the temperature rhythm retains its 25-hour period. Up until now, this has been the best example of 'internal desynchronization'; it has been used as evidence that circadian rhythmicity depends on several biological clocks, as one oscillator cannot run at two different frequencies simultaneously. The data on which the argument rests have recently been re-analysed by J. Zulley and S.S. Campbell (*Human Neurobiol.* **4,** 123; 1985 and *Sleep 84* (eds Koella, W.P., Rütter, E. & Schultz, H.) 81; Fischer, Stuttgart, 1985).

The question of whether there are one or several oscillators controlling circadian rhythms is not only of great importance to specialists on rhythms, but also has practical implications in understanding adjustment to shift work. It it also an essential ingredient of some recent theories about the role of biological rhythms in depression and cycles of mania and depression.

Both presentation and selection of data have contributed to the view that sleep and temperature can become desynchronized. Rhythm data are frequently double-plotted — a given time-segment, say 24 hours, appears twice, once below the previous segment and once beside it (on the right in Fig. 1.) This makes it easy for the viewer to see continuity in data spanning two 24-hour periods, rather than having to glance back to the start of the 24-hour segment below. The principle of double mounting is often extended to treble and multiple mounting.

Figure 2*a* shows an extended plot of data on major sleep episodes using the multiple-mounting method. In this case, however, the principle of showing continuity has been carried even further by plotting each sleep episode only once. This extended plot draws the eye across the page in a way that emphasizes differences in the periodicity of the sleep and temperature rhythms. Textbook illustrations are often in a format similar to that of Fig. 2*a*. When the sleep episodes are also plotted below each other (Fig. 2*b*), it is much less clear that the periodicity of sleep and temperature are different. But there do remain some days when sleep is apparently absent at the times of temperature minima, which is evidence for a long periodicity in the sleep rhythm.

But what is sleep? Here we come to the problem of what to include in the database. In classic diagrams showing internal desynchronization, only times that the subjects themselves considered to be major sleep episodes were included and naps were excluded. In fact, subjects were instructed not to take naps but to remain active between the times that they experienced as night. Some subjects were either unable or unwilling to follow these instructions. If they decided to sleep outside what they considered to be their major bout of night-time sleep, they pressed a button indicating they were taking a nap. But, as Zulley and Campbell point out, some of these 'naps' lasted several hours, as long as major sleep episodes. When such naps are included in the plots (see Fig. 2*c*), they cluster around the time of the temperature minima. There are also some shorter naps in the middle parts of what is perceived as day, but whatever it is called, some sleeping takes place nearly every day around the time of the temperature minima. The evidence for internal desynchronization disappears — almost.

To salvage the hypothesis, it has to be postulated that internal desynchronization occurs between what the subject per-

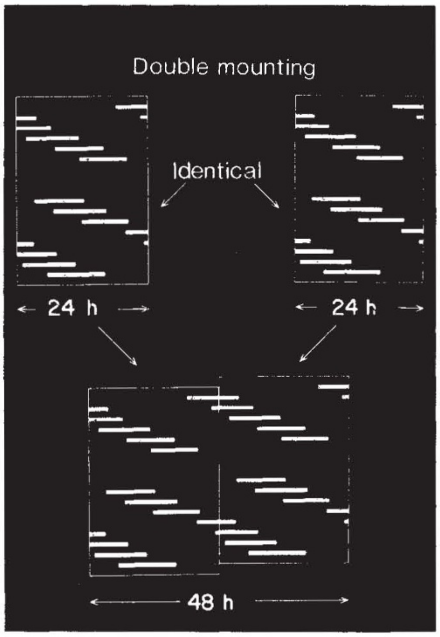

Fig. 1 Double-plotting method for showing data on biological rhythms. Two identical photographs of the same data are mounted side by side to give consecutive 24-hour spans across, as well as down, the page.