Stereoscopic Depth Effect

Pastore (15 May, p. 888, note 2) suggests crossing one's eyes, as a substitute for using a stereoscope, to induce a stereoscopic depth effect. I find this maneuver rather difficult with his Fig. 1. However, since the two views of the figures as it appears [reduced in size] in *Science* are spaced less than the intraocular distance, I find a much easier method for viewing is to relax convergence (as though one were looking at a distance) and then look at the figure. After a moment or two, the stereoscopic depth effect is readily perceived. Of course, the depth effects obtained are the reverse of those that result when the eyes are crossed.

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"Circadian"

Clark and Baker, in their report "Circadian periodicity in the concentration of prolactin in the rat hypophysis" (*1*), have used the term "circadian" erroneously.

Biological rhythms—which are a common feature in the lives of most organisms—will quite often persist even when the organisms are placed in constant conditions. In natural, alternating day-night cycles, the rhythms are 24 hours long; but when organisms are subjected to constant conditions, the period usually differs from 24 hours, being a little longer or shorter. To describe these latter periods, Halberg *et al.* (*2*) have coined the term "circadian" (*circa*, about; *diem*, day) "to denote periods which differ from 24 hours by not more than a few hours." This term is therefore restricted to rhythms (i) which will persist in constant conditions and (ii) whose period is not 24 hours long.

Clark and Baker tested mice which were maintained in alternating 12-hour periods of light and darkness and therefore described a rhythm which was 24 hours long. This rhythm might well persist in constant conditions and, if so, would probably have a period which would be longer or shorter than 24 hours (thus being truly circadian). This experiment was not, however, performed. Therefore, these authors' use of "circadian" is incorrect. Hamner (*3*) has made the same mistake.

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References

1. R. H. Clark and B. L. Baker, *Science* **143**, 375 (1964).
2. F. Halberg, E. Halberg, C. P. Barnum, J. J. Bittner, in *Photoperiodism and Related Phenomena in Plants and Animals*, R. B. Withrow, Ed. (AAAS, Washington, D.C., 1959), p. 804.
3. W. M. Hamner, *Science* **142**, 1294 (1963).

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We have failed to find in the papers by Halberg and his collaborators, including the one cited by Palmer, any limitation of the term "circadian" to rhythms (i) which persist under constant conditions or (ii) whose period is not 24 hours long. In fact, Halberg himself uses the term in the sense in which we employed it in the paper under question. The publication "In vitro exploration of a circadian rhythm in adrenocorticotropic activity of C mouse hypophysis" (*1*) illustrates the point. In "Physiologic 24-hour periodicity; general and procedural considerations with reference to the adrenal cycle" (*2*), Halberg makes the following statement: "Thus, 'circadian' might be applied to all '24-hour' rhythms, whether or not their periods, individually or on the average, are different from 24 hours, longer or shorter, by a few minutes or hours."

"Circadian" is a most useful term to designate rhythms with periods which approximate 24 hours. It would be unfortunate if the term were limited to include only rhythms which persist under "constant" conditions. Usually it is impossible to know which factors must be controlled to maintain constancy of the environment.

Furthermore, absolute constancy ordinarily is not achievable. "Diurnal" is an appropriate term also, since it connotes an event which occurs within the period of a day. However, as pointed out by J. L. Cloudsley-Thompson (*3*), "diurnal" is a more ambiguous term than "circadian," since it implies daytime as opposed to nocturnal activity.

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References

1. F. Ungar and F. Halberg, *Experientia* **19**, 158 (1963).
2. F. Halberg, *Z. Vitamin-, Hormon- Fermentforsch.* **10**, 225 (1959).
3. J. L. Cloudsley-Thompson, *Rhythmic Activity in Animal Physiology and Behavior* (Academic Press, New York, 1962).

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Dolphin Telemetry

For anyone wishing to perform such experiments as those described in my recent report (15 May, p. 864) there is an additional useful observation. In the previous experiments the diameter of the ingested capsule was minimized by considerable effort, because in postmortem examinations the dolphin gastrointestinal tract seemed small. Fear of impaction was aggravated by lack of a known general anesthetic under which surgical removal could be performed, though electronarcosis probably would have been effective. Recently, a test capsule 1 cm in diameter and 5 cm long, containing an Alnico magnet, was successfully employed in *Tursiops truncatus*. The purpose of the magnet was to allow external jostling in a binding situation, and in addition it allowed approximate position in the animal to be determined by a compass. Though a larger capsule might be regurgitated after supplying useful information, or a fragmenting transmitter might be built for the purpose, the size described allows use of standard batteries and ferrite cup cores for transformers and pressure transducers, all in a convenient cross-wise orientation, so that construction is much simplified.

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