[*From the Proceedings of the Physiological Society*, 11–13 *July* 1985
Journal of Physiology, **369**, 55*P*, 1985]

Preparation of brain slices from the suprachiasmatic nuclei of rat can reset the circadian clock

By Martha U. Gillette. *Department of Physiology and Biophysics, University of Illinois, Urbana, Illinois 61801, U.S.A.*

Hypothalamic neurones of the suprachiasmatic nuclei (SCN) comprise a primary oscillator that organizes circadian rhythms in mammals (Rusak & Zucker, 1979). The ability to keep 24 h time, expressed most directly as an oscillation in neuronal firing rate, is an endogenous property of these neurones and survives isolation using the hypothalamic brain-slice technique (Green & Gillette, 1982). The relationship of circadian time of brain-slice preparation and the phase of the next firing rate oscillation of SCN neurones *in vitro* has been examined systematically in rats. For SCN in hypothalamic slices prepared during the donor's day, single unit activity continued unperturbed in its circadian oscillation, with the subsequent peak in single unit firing occurring at a circadian time (CT) similar to that observed both in animals implanted with chronic multiunit electrodes (Inouye & Kawamura, 1979) and in previous studies on isolated SCN (Green & Gillette, 1982). Six such experiments on slices prepared at various points in each donor's light periods showed little variation in the next oscillation, with a mean peak at CT $7{\cdot}87 \pm 0{\cdot}65$ (S.D.) h. Isolation of the SCN during the dark portion of the circadian cycle, however, produced marked changes in the phase of the next oscillation. SCN isolated during the first 4 h of two donors' dark periods produced delays of 1·8 and 3·8 h in the appearance of the peak of the next oscillation in electrical activity. Brain slices prepared later in the dark period showed a phase advance of up to 4·5 h (mean $2{\cdot}98 \pm 0{\cdot}77$ h (S.D.; $n = 9$)). The sign and shape of the phase–response relationship for resetting these neural activity rhythms is very similar to those for intact animals, where light flashes reset wheel-running activity (Decoursey, 1964) and direct electrical stimulation of SCN reset both activity and feeding rhythms (Rusak & Groos, 1982). The faithfulness of the phase-shift data from the isolated SCN to that for intact animals indicates that the resetting mechanism is endogenous to the SCN, and that when stimulated it proceeds normally *in vitro*. We now have a time-frame for preparing brain slices containing perturbed and unperturbed circadian systems in isolation.

Supported by NSF BNS 83-08551 and PHS-BRSG-RR7030.

REFERENCES

Decoursey, P. J. (1964). *J. comp. Cell Physiol.* **63**, 189–196.
Green, D. J. & Gillette, R. (1982). *Brain Res.* **245**, 198–200.
Inouye, S. & Kawamura, H. (1979). *Proc. natn. Acad. Sci. U.S.A.*, **76**, 5962–5966.
Rusak, B. & Groos, G. (1982). *Science* **215**, 1407–1409.
Rusak, B. & Zucker, I. (1979). *Physiol. Rev.* **59**, 449–526.