

# **Dynamics of the Human Body Clock**

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The human wake-sleep cycle is coupled to a "body clock" with a natural period in most people close to 24 hours. The phase of this body clock is entrained by light. The sensitivity of the body clock to light is a function of the part(s) of the body exposed to light, the intensity of the light, and the phase of the body clock. This paper explores the effect on the body clock of various patterns of light, as determined by the ambient light of various intensities and by whether the eyes are open. The dynamical model used is based on one developed by Kronauer, modified to include the feedback effects of the wake/sleep state on light exposure to the retina. The results are presented in two parts: First are simulation experiments and human data oriented toward controlling the phase of the body clock during normal activity, in order to obtain and stabilize a desired sleep/wake cycle. Additional simulation experiments and data explore techniques for rapid resetting of the body clock, such as to adapt to different work shifts or overcome jet lag.