Circadian rhythms Preface

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Preface

Circadian rhythms

The circadian clock controls our lives! It dictates when we sleep and wake and when we perform and think optimally. The clock in our brains – and that in each of our cells – is not so different from clocks described in mice, fruit flies, plants and algae, fungi, and even some bacteria. They typically show a circa 24 h oscillation when placed in certain constant conditions (shielded from the 24 h cycles in the environment) demonstrating their enogenous nature. They are designed to be entrained to a 24 h day by signals from the environment, such as light, food and temperature, called zeitgebers. They are apparently cell-based, in that each cell is oscillating, although it is clear that the amalgam of cells (e.g. an organ or an organism) will have unique properties relative to single cells. The function of clocks across the phyla is generally thought to be the imposition of a temporal structure on biology, such that many physiological tasks are relegated to specific times of day. That clocks enhance fitness is shown, on one hand, by competition experiments that demonstrate the advantage of a circa 24 h oscillation in a 24 h environmental cycle and, on the other hand, by the incidence of pathologies in individuals who live 'against the clock' such as shift workers.

Since 1971, when the first description circadian clock mutants in *Drosophila melanogaster* was published, the field of chronobiology has been aiming at elucidation of molecular clock mechanisms. A theme has emerged showing a transcriptional feedback loop that is an important feature of all clocks so far described. This loop however is part of a highly complex genetic network in the cell and, as a field, we are just beginning to appreciate non-genetic levels of regulation and how they contribute to the molecular clock. The papers that follow are meant to bring us up to date and to peek into the future of emerging mechanisms and emerging model systems.

This Special Issue of FEBS Letters is a compilation of reviews on topics that span the molecular biology of the circadian clock and the various model genetic systems used in chronobiology research. The Editors at FEBS recognised that chronobiology is a hot topic for all biologists and initiated this collection. Time – the 4th dimension – has implications for all scientists who study living systems. What is not rhythmic?

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