Rhythms of Life: The Biological Clocks That Control the Daily Lives of Every Living Thing

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Rhythms of Life is a successful attempt to present what is currently known about time cycles in living creatures. It is a book about biological clocks, that is, the biological mechanisms that enable all organisms from bacteria to worms, plants, birds and mammals, including humans, to 'tell' the time. This extraordinary ability in organisms allows the exhibition of rhythmic behaviour that can be presented in cycles of a single day (circadian) or longer than one day (infradian).

Time is embedded in genes and, therefore, cells are able to tell the time, making it possible for an organism's physiological and biochemical functions to follow a rhythmic pattern in synchrony with daily, monthly or yearly changes in the environment. Vital bodily processes, such as sleep, heart-beat, blood pressure, liver function, body temperature and hormone production, change according to the time of day – which is naturally determined by the position of the Sun in the sky and the resulting alternation of day and night, light and darkness. Similarly, certain behaviours in organisms, such as mating, migration, hibernation and flowering, are exhibited in cycles of months or even years, in response to temperature and humidity changes, food availability and many other predictable environmental cues.

The dependence on the biological clock becomes evident to humans when they try to override the ancient time patterns dictated by their internal timer, by engaging in unnatural behaviours such as travelling fast across multiple time zones or working 'unfriendly' shifts. As a consequence, they experience a variety of symptoms that range from mild jet-lag to potentially life-threatening conditions such as depression and sleep disorders.

Although *Rhythms of Life* could be classified as a biology book, it is not intended to be read strictly by biologists. The content of the book is scientific but the language is quite simple, so that anybody with a minimal understanding of biology could benefit from reading this book. Of course, it contains a great deal of up-to-date information about biological clocks and rhythms, making it more suitable for people with a strong interest in this topic. Consequently, the casual reader who just wants to know about biological clocks and rhythms, and how they affect humans, might find the book to be a little heavy. This disadvantage can be at least partially compensated by the fact that the reader can focus on small selections from the book and still attain a good understanding of the issues being discussed. Also, the short glossary of common terms may prove quite useful to the lay reader who is determined to get the most out of the book. In any case, a good starting point in *Rhythms of Life* is the excellent introduction, which starts with a general overview of biological clocks and rhythms and then goes on to summarise the information in each of the 14 chapters.

At first glance, *Rhythms of Life* does not present itself as a handy teaching tool. It is not the kind of book a teacher can simply take into the classroom and use as the main didactic material. Nevertheless, with a little imagination and the desire to explore alternative forms of teaching materials and methods, the teacher can find *Rhythms of Life* to be a useful source of information for teaching a variety of science topics, mostly in the field of advanced high-school biology.

In fact, biological clocks and rhythms offer a unique opportunity to investigate a variety of common phenomena, by studying the many parameters involved in and responsible for their appearance from the perspective of the different sub-disciplines of biology. For example, *evolution* can explain how rhythms may

have developed as adaptive mechanisms to the cyclical and predictable changes observed on Earth for millions of years. *Physiology* and *molecular biology* can cope with the dissemination of how the clock mechanism works. *Genetics* can help unravel the details regarding the way a specific rhythmic behaviour is controlled through the concerted interaction between genes, proteins and neurotransmitters. All these and many more investigative approaches could be applied to the study of a rhythmic phenomenon as simple as sleep, in the form of small projects carried out by advanced high-school biology students.

To readers who are not so concerned with the scientific details of rhythms but rather prefer to take advantage of the applicable information derived from this knowledge, the book offers a valuable gift. The table in Appendix I provides specific information about numerous rhythms in humans which affect the body and mind performance, the susceptibility to disease and the general biochemistry of the body. Therefore, all those determined to optimise the effectiveness of their daily routine should take into account the timing of their rhythms when planning their everyday schedule. Finally, for those forced to hop across multiple time zones frequently, Appendix II contains sound scientific advice on how to minimise the symptoms of jet-lag.

Apart from the presentation of scientific information, the most important contribution of *Rhythms of Life* is, perhaps, a message directed to any reader, be it a science teacher, a student or the lay public. Despite their technological advances, from the perspective of biology, humans are mammals. As such, their decision to live in a 24-hour/7-day society brings them in conflict with their basic biology. This often causes excessive stress on the physical health and mental well-being of the individual, a situation that may sometimes lead to catastrophic results.

Details

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