ground material on German contributions to the development of modern astrophysics, and for that alone it is well worth having.

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The Cell Division Cycle

Cell Cycle Clocks. LELAND N. EDMUNDS, JR., Ed. Dekker, New York, 1984. xiv, 616 pp., illus. $99.75.

This volume draws together a wide variety of data and models that pertain to the possible relation between intrinsic biochemical or circadian oscillators and the timing of events in the prokaryotic and eukaryotic cell division cycle.

The 27 chapters in the volume are divided into six sections, each prefaced by a short, useful introduction by the editor. Part 1 deals with general features of the origin and breakdown of temporal organization in cells in four chapters by Gilbert, Lloyd and Edwards, Klevecz, and Winfree. Part 2 considers models of the cell division cycle and its variability, with two especially interesting chapters on circadian variation by Thorud *et al.* and Keiding *et al.* and a most useful compendium of the variation in the phases of the cell cycle by Guiguet *et al.*

Part 3 deals with regulatory aspects of the cell division cycle and introduces the "events, sequences, pathways, and timers" that are central to much of the rest of the work presented. The initial chapter by Mitchison treats the interaction of the DNA division cycle and the growth cycle (updating the material first presented in his 1971 book). Painter and Tyson examine the possible role of periodic enzyme synthesis in the control of the cell cycle, and Poole reexamines the hypothesis that energy metabolism may serve as the timer for division (this hypothesis is also considered in the chapter by Lloyd and Edwards). In the next two chapters Cooper and Mendelson each examine the continuum and helix clock models of the cell cycle (the helix clock model proposes that spatial order may be utilized to provide temporal order for the cell division cycle). Analyses by Fantes and by Tyson and Sachsenmaier give strong support to the hypothesis that division is regulated by a cell "sizer" and thus offer a good springboard for Part 4, which examines the possible role of autonomous intrinsic oscillators with circadian or near-circadian periods in the control of the cell division cycle. Shymko *et al.* and Petrovic *et al.* examine the possible role of a quantized oscillator with added noise in the cell division cycle. Edmunds and Laval-Martin summarize data from a variety of cell types that support the argument that there is a circadian-type oscillator involved in the timing of the cell division cycle. The final three chapters emphasize the interaction of environmental cues with the cell division cycle.

Part 5, which deals with the relation between the cell division cycle and cancer, opens with an interesting speculation by Willie and Scott about the way in which alteration of an underlying oscillator controlling the cell division cycle might lead to neoplastic transformation. Scheving and Moller each emphasize the importance to therapeutic interventions of circadian variation in the cell division cycle. Part 6 deals with the cell division cycle in development and aging. A paper by Belisle *et al.* is particularly interesting in its treatment of the relation between the cell division cycle and development in the sea urchin. The final chapter, by Zorn and Smith, presents new data on aging in cultured cells, which again indicate that aging is associated with a lengthening G_2 phase of the cell division cycle.

The book is noteworthy for the number of new data presented and the number of new and imaginative proposals made concerning the regulation of the cell cycle. The editor is to be congratulated for his selections and for the production of a finished product in which the chapters exhibit a high degree of conformity.

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