Theoret. Chim. Acta (Berl.) 42, 95 (1976)

THEORETICA CHIMICA ACTA

Book Reviews

T. Yoshizawa: Stability Theory and the Existence of Periodic Solutions and Almost Periodic Solutions, Vol. 14 of "Applied Mathematical Sciences". Berlin-Heidelberg-New York: Springer-Verlag 1975. VII + 233 pp., price US $10.10 (DM 23.30)

Ordinary differential equations play an important role in wide parts of theoretical chemistry. Historically they appear in connection with the phenomenological theory of chemical kinetics, and the recent progress in this domain originates in modern developments in the theory of differential equations. In molecular quantum mechanics they are of interest for the description of the dynamics of macroscopic variables and of the time evolution of order parameters in non-equilibrium phase transitions.

The class of differential equations for which closed solutions are known is very small and therefore the main interest has concentrated since long ago on the study of the *qualitative* properties of differential equations. Numerical integration is of limited interest for theoretical investigations because it gives only modest insight into the analytical structure of the problem whereas it can be useful for the illustration of the general theory by models. The qualitative theory of ordinary differential equations deals with existence, uniqueness, stability, and boundedness of the solutions, with their behavior in the neighborhood of critical points and closed orbits, with bifurcation, regular and singular perturbation, and the structure of flow invariant sets. Topological dynamics and differential equations in abstract spaces (semigroups) are generalizations of actual interest.

There is no lack of books on stability theory and there are some books on non-linear oscillations. The present monograph treats the problems of periodicity with the methods of stability theory and may serve as an introduction to both. It contains stability theory by Ljapunov's second method, and a somewhat extended discussion of stability properties in almost periodic systems. The existence of an almost periodic solution in an almost periodic system is discussed in connection with the boundedness of solutions, and the existence of an almost periodic solution in an almost periodic system is considered in connection with some stability properties of a bounded solution.

The first two chapters are introductory and present the preliminaries about Ljapunov functions, almost periodic functions, stability theory, and boundedness. In the third chapter the author presents the main material in a branch of research which was inaugurated by himself fifteen years ago and to which he has added numerous contributions.

The book gives a good impression of the state of the art and is recommended to scientists who are concerned with stability and boundedness properties of open chemical reaction systems.

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Received May 5, 1976