

The problems involved in selecting hardware for real-time systems are not discussed, nor are the substantial software requirements of real-time processing listed. No checklist of "do's" and "don't's" is offered the would-be systems designer.

Two problems described in the book require comment. One is that of reliability, which was resolved in the Mercury system by utilizing duplicate 7094 systems. This must certainly draw a shudder from budget-pressed systems managers. Very few installations can afford this redundancy. Strong exception must also be taken to the implications that airline agents had to learn how to use the system for it to operate effectively. This is solving hardware or programming problems by manual procedures. There is too much of this sort of thing, and its extension should be discouraged.

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## LOW FREQUENCY SIGNALS

*Title* Whistlers and Related Ionospheric Phenomena

*Author* Robert A. Helliwell

*Publisher* Stanford University Press, 1965

*Pages* viii + 349

*Price* \$12.50

*Reviewer* Erwin R. Schmerling

The author, whose group at Stanford University has long been associated with pioneering work in this area, gives an account of some of the rather remarkable phenomena observed in the kilocycle region of the radio spectrum. He discusses in some detail, from the viewpoint of geometrical optics, how low-frequency signals can enter the ionospheric duct and be propagated nearly along a line of force of the earth's magnetic field. Both ducted and nonducted propagation are treated. He shows how the dispersion of ducted whistlers generated by lightning flashes may be used to obtain both the latitude of origin and the electron density at the top of the path. This treatment is entirely from the ionospheric viewpoint, although the same theory is also applicable to plasma diagnostics in the laboratory.

A number of other types of very low-frequency emission, with entirely different dispersive characteristics, is also discussed, and the evidence is summarized for the triggering of periodic emissions by whistlers. This section is particularly well illustrated by numerous sonograms.

The viewpoint is mostly that of ground-based observations. It is unfortunate that it was not possible to include the phenomena recently discovered in satellites which appear to depend on the ionic composition of the medium, and it is hoped that a later edition will include a full discussion of proton whistlers, hybrid resonance effects, and subprotonosphere whistlers.

The style is readable and clear, and the historical introduction is excellent. This book can certainly be recommended to any reader who wishes to obtain a good start in this area.

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## TWO GROUPS: PRAGMATIC APPROACH

*Title* Two-Group Reactor Theory

*Author* J. L. Meem

*Publisher* Gordon and Breach Science Publishers, 1965

*Pages* xiii + 417

*Price* \$20.50

Text edition available

*Reviewer* Frederick J. Shon

A whole book about two-group theory? Well! Not really. This book, like many short-story anthologies, takes its title from what its author considers the most important of its facets. It is, in fact, a rather complete introduction to elementary reactor theory.

The first six chapters cover a broad range of subjects, including One Group and Fermi Age Theories, with a brief treatment of reactor kinetics and a nod at transport theory in the bargain. The reason for the title is that the two-group theory has been selected for detailed treatment. Indeed, the treatment is far more detailed than is available in any other text to my knowledge. The author's reason for selecting two-group theory as his calculational mainstay is that it represents an approach of sufficient sophistication to give useful results, but sufficient simplicity to permit hand calculations. Dr. Meem feels in fact that, since two groups are about as far as one can