CC/NUMBER 23
JUNE 8, 1981

This Week's Citation Classic

Newcomb R W. *Linear multiport synthesis.* New York: McGraw-Hill, 1966. 397 p.
[Dept. Electrical Engineering, Stanford Univ., Stanford, CA]

This book gives a full theory of linear time-invariant multiports. In the beginning it develops the foundations of network theory using allowed pairs of port variables. After presenting readability constraints, complete syntheses, including scattering matrix ones, are presented. Equivalent network theory finalizes the treatment. [The *SCI*® indicates that this book has been cited over 160 times since 1966.]

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April 29, 1981

"Sometime in 1962 an announcement was circulated to the Stanford electrical engineering faculty, which I had joined two years earlier, presenting a Fulbright Research Fellowship opening in Australia. Having always dreamed of seeing Australia and the South Seas and having a number of research topics to develop, I quickly applied. To my great joy the application led to an award for 1963-1964. My family and I were soon on the liner *Oriana,* leaving San Francisco and beginning one of the most memorable periods of our lives.

"The application was formally to pursue research that I had begun at Berkeley on multiport synthesis. The field of linear multiport synthesis had recently been advanced through some scattering matrix results appearing in Japan and Belgium in works little known in the US, as well as a mathematically formal but little understood work out of Bell Laboratories. Previously I had tied these works together but the theories were still somewhat fragmentary and needed, I felt, a coherent theme. This theme is what I tried to develop through the theory of equivalent networks which I then used as the culminating point of this book. As it turned out, though, the background analysis was almost completely lacking in the literature and, hence, much of my effort was devoted to building up the 'Foundations of Network Theory' which the first third of the book covers. In this I found it important to develop a theory of allowed pairs of port variables which I think has turned out to be fundamental to understanding network theory.

"Concerning the synthesis portion of the book it should be noted that engineers in the US had previously concentrated upon transformerless and gyratorless synthesis, which, though important, I felt led to unnecessarily restrictive results. Thus. I concentrated upon the more extensive class of time-invariant networks for which a complete set of syntheses is given in the book. Since transformers, gyrators, and active components can now be nicely constructed with integrated circuits, my choice of topics proved fortunate and I was then able to round it out in more practical form in a follow-up book.[1] To finish the book there is presented a full theory of equivalent networks. Perhaps, then, the book's popularity and frequent citation have stemmed from its uniqueness in giving a complete theoretical development with emphasis upon scattering theory, which was becoming practically important at the time of publication, for a design oriented branch of electrical engineering.

"Of course in going to Australia there were many adventures. Suffice it to say that I was able to initiate my international activities.

"My philosophy is that engineering is more than a set of technical facts; it is a way of life which pervades all of life and in which the artistic should play a large part. Consequently a book in the field should be a work of art. Some people do not agree with my philosophy which causes me no end of trouble in publishing technical works, as this book. Indeed I must continue to thank a reviewer who stood up for me on this score so that my book was published. So much of my life is in this book."

1. **Newcomb R W.** *Active integrated circuit synthesis.* Englewood Cliffs, NJ: Prentice-Hall, 1968. 292 p.