PREFACE

How can two tin cans and a string be a lot of fun? In my childhood, these items could be used to make a "toy" telephone. Each end of the tin can was connected to the string, which was stretched by pulling away the two tin cans. These tin cans were used for both a microphone and an earphone.

As we grew older, we "graduated" from the tin-can communication system and discovered that walkie-talkies were a better solution. Now, there were no strings and no cans, but pocket-size "miracle" electronic devices using earphones, microphones, oscillators, antennas, and electromagnetic waves to do the job. Telephones were also installed virtually at every corner, and for a token we could dial a number and be connected with a friend anywhere almost instantly—that was an amazing thing! In Marvel Comics, we read about a science-fiction policeman who had a wrist "telephone" with which he was able to talk to anyone! We also read in illustrated classics that people of the past communicated using light or smoke signals and that thousands of years ago someone tried to answer the question: Does light propagate in a transparent medium following its curvature or does it travel in a straight line? He discovered the former and used a bucket of water to prove it—how simple!

Yesterday's science fiction is today's reality. Simple experiments of the past have helped us to understand the nature of things. Three crystals fused together created a transistor, which revolutionized the way we live. The wrist-size communicator is not fiction any more. Pocket-size powerful computers and credit-card-size communication devices are a reality. Satellite communication networks are not "pie in the sky." At the click of a button, one can access virtually any source of information around the globe. Wireless telephony and data, Low Earth Orbit Satellite (LEOS) systems, and fiber-optic communications are realities. Direct-to-satellite communications enable wireless connectivity anywhere at anytime in the world and also provide global positioning within an accuracy of a few feet. A single optical fiber can transport the contents of hundreds of thousands of volumes within a second. We are on such a "technological roll" that we cannot even guess what the next 20 or 50 years

will bring. Hopefully, however, technology is advancing solely to serve humanity, and we will never allow it to control humanity, as some science fiction predicts. Otherwise, what is the point?

For the last few years, I have been working on both the Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) and the asynchronous transfer mode (ATM). In addition, my work on mapping ATM over SONET/SDH payloads for my company's proprietary systems has led me to several innovations. My work in this subject culminated into a set of notes and viewgraphs that had educational value to both me and my colleagues. As a result, I decided to give an introductory tutorial at a public forum, the International Communication Conference, 1998. The tutorial far exceeded our estimated attendance. It was received with enthusiasm, and many attendees suggested publishing my notes. The intention of this book is to provide an introduction to SONET/SDH, ATM, and ATM over SONET, and to also touch on the subjects of the Internet, dense wavelength division multiplexing (DWDM), and convergence—all subjects related to optical communications. This book is not meant to replace related standards; readers interested in further details of SONET/SDH or ATM are strongly recommended to consult the latest version of them prior to design work, as these are the official recommendations. I wish you happy and easy reading.

Stamatios V. Kartalopoulos
Lucent Technologies, Inc.