Preface

Understanding Information Transmission is an introduction to the whole field of information engineering. Its seven chapters span the nature, storage, transmission, networking and protection of information. The book has two intentions: First, it is a second-year course book for new university programs in Information Technology (IT); secondly, it appears within the IEEE "Understanding Series" which was designed for those who wish to learn a new field on their own. In our case the field is the rapidly evolving field of IT. A special feature of the book is its treatment of the spectacular history of the subject, its people and inventions, and its social effects on all of us.

As a text, the book has been used in the required introductory course on Information in the first year of the Information and Communication Technology engineering degree program at Lund University in Sweden. The present version has been used for three years in that course. One of us (JBA) also worked within the IT program at Rensselaer Polytechnic Institute. Baccalaureate IT programs like these are starting up all over the world. Because they are so new it is worthwhile to look at their curriculum requirements.

These four-year IT programs combine courses from a variety of information disciplines. A typical curriculum might consist of courses in communication engineering, signal processing, software engineering, programing, computer science, mathematics (discrete mathematics, probability, linear algebra/complex variables), man–machine issues, psychology, and linguistics. To this may be added in some countries a proportion of liberal arts, economics, and management electives. Certain traditional engineering courses, for example, thermodynamics, mechanics, and materials, are often squeezed out. The prerequisites for our book are those for a course early in this structure. We assume a modest first-year university (U.S.) or gymnasium (Europe) preparation in mathematics (specifically, calculus, complex variables, and elementary probability) and physics (electromagnetic waves and DC electrical circuits). Review appendices are offered to help a reader who is missing parts of the prerequisites. Information engineering is a subject that is full of mathematics, and Chapter 2 is devoted to the core mathematical techniques of the discipline. The chapter develops Fourier transforms and bandwidth, linear systems and convolution, and some circuit ideas.

An IT degree program can be administered by an electrical engineering (EE), computer engineering, or computer science department, or possibly by a school of information technology. A program offered by one of the first three is necessarily a compromise compared to a traditional electrical engineering or computer science program. A degree recipient lacks circuit, fields and waves, and physics/device courses compared to an electrical engineer; he or she lacks advanced programing, computer science and architecture courses compared to a computer science major. The combining of parts of the EE and computer science curricula, as well as courses from the softer sciences, places a special strain on IT programs. These compromises are present in the pages of *Understanding Information Transmission*. It is necessary to skip over many details. Furthermore, an understanding of the information processing discipline must be achieved in one book rather than several, and in an IT program this must occur at an early point in the curriculum.

The pedagogy behind this book and its choice of contents evolved over many years. A book like this can only arise from thousands of encounters with students, and we would like to acknowledge first the students and colleagues who made it possible, and especially the students in the first three years of the Infocom Program at Lund University. Next we wish to thank the Information Technology Department at Lund, which set aside significant resources for the preparation of the book. Particularly, we are grateful to Lena Månsson and Doris Holmqvist, whose enthusiasm and outstanding skill at Latex made it possible to complete this manuscript. Within IEEE and Wiley, thanks go to the production staff at Wiley and to our editors Tony VenGraitis and John Griffin, whose warm support we enjoyed from the first day. Thanks also are due to our colleague James Massey and to Oliver, the world's leading canine information theorist, for debating many issues with us. Finally, we are indebted to Jennifer Bissett for transforming her views of information transmission into a striking cover.

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