The book *Fundamentals of Wireless Communication*, written by David Tse and Pramod Viswanath, presents a very good summary of the concepts and techniques used for the physical layer of radio networks that have emerged mainly during the last 10 years. The first chapters introduce wireless fading channels, diversity, multiple access, and interference management. The second part of the book covers the topic of multiple antennas, especially MIMO systems, with the authors concentrating on spectral efficiency and bit error probability.

Since David Tse and Pramod Viswanath cooperate closely with the Information Theory Society as authors, editors, and chairmen of its conferences, they are very experienced in information theory. The references mainly include papers from this field. Thus, the authors of the book generally focus on the possibilities of the presented wireless systems. They describe the ideas and concepts, while the problems of construction and practical implementation are omitted. Yet, in order not to lose contact with practice, examples of working systems are abundantly included. The authors very suggestively present the phenomena associated with radio propagation, enabling the reader to create a holistic image of the complexity of radio transmission. When considering difficult problems, the authors analyze easy examples in the first place, and then examine more complicated cases.

The scope of the book is focused on cellular networks. However, the topics addressed there can also be considered applicable in other wireless systems (e.g., WLANs, point-to-point radio links) that can be thought of as parts of cellular networks.

The book is organized as follows. After a short introduction characterizing the subject matter in Chapter 1, the authors present wireless channel models in Chapter 2. The emphasis is placed on slow and fast fading channels; their coherence time and bandwidth are defined. Chapter 3 deals with point-to-point communication. Diversity as a technique to combat deep fading is explained. Intersymbol interference in transmission over wideband channels is also discussed, as well as the impact of channel uncertainty. In Chapter 4 the emphasis is shifted toward the whole cellular system. The problems of limited bandwidth, multiple access, interference between users, and frequency reuse are introduced. The authors describe three different system designs: a system with narrowband channels (e.g., GSM), code-division multiple access (CDMA), and orthogonal frequency-division multiplexing (OFDM).

Chapter 5 develops the notions of capacity and outage as the measures of quality of the wireless channel. The channel side information appears to be crucial: when the channel is known at the transmitter, the waterfilling power allocation can be done, which in turn increases the capacity. Additional antennas at the receiver (SIMO) or transmitter (MISO) can provide extra diversity and power gain. In Chapter 6 the techniques of successive interference cancellation, multiuser diversity, and opportunistic communication are discussed. When applied, they increase capacity of a radio channel shared by many users. Also, the concept of opportunistic beamforming, developed by one of the authors (Viswanath), is presented.

The last four chapters focus on MIMO systems. Chapter 7 introduces simple MIMO channel models. The rank and condition number of the channel transfer matrix are defined as criteria of the performance of a MIMO system. Singular value decomposition is also provided as a method of achieving capacity. Chapter 8 describes some solutions for complete MIMO systems: V-BLAST and D-BLAST, as well as the architectures of the following receivers: joint ML decoder, linear decorrelator, and MMSE receiver with or without successive interference cancellation. In Chapter 9 the trade-off between data rate and error probability in MIMO systems is explained. The criterion for optimal codes is shown. In the last chapter the performance of MIMO systems in multiuser channels in cellular networks is illustrated. Uplink and downlink are considered separately — the greatest complexity is always at the base station. Finally, techniques for intracell and intercell interference management are discussed.

After each chapter of the book, there is a short summary of the relevant literature. The whole list of references includes more than 150 entries. However, there are hardly any references given in the text of the chapters. Thus, finding related information in additional sources is difficult. In each chapter there are many exercises provided, yet without solutions. These exercises are presented rather as problems for readers to consider on their own; thus, hints and suggestions are often appended. The authors move some difficult cases and exercises from chapters to exercises. The book also contains two appendices. The first gives details of Gaussian random variables and Gaussian noise. The second presents the results of information theory about the capacity of communication channels.

Tse’s and Viswanath’s book addresses the most current topics and presents results from recent years in radio communication theory. It can be very helpful for teachers preparing courses in this field. I strongly recommend this book for graduate students taking a course in wireless systems. The first four chapters can be recommended for use in an undergraduate course in wireless communications as well. The book could be considered a little too theoretical, but the authors have a rare ability to create the proper perspective while describing the concepts and techniques. Having read it, the reader achieves an integral and coherent view of wireless channels and systems.
Book Reviews. Interested in the exciting world of children's literature available out there? Take a look at Mocomi's picks and reviews of books children won't want to put down. CATEGORIES. App and Game Reviews. Movie Reviews. Toy Reviews. Zakir and his Tabla: Dha Dhin Na - Book Review. Zakir Hussain can be considered India’s most famous tabla player. Beginning his relationship with music at the age of 3, when he learnt to play the mridang, he has inspired countless budding musicians.