through solar energy; the development of solar ponds for electric energy production; and the mechanical operation with solar energy; the development of solar energy optimization and urban planning. This book is an invaluable resource for scientists who need the scientific and technological knowledge of the wide coverage of solar energy sciences and engineering applications. This will further encourage researchers, scientists, and engineers to develop more efficient and effective methods for using solar energy.

Introduction to Nonimaging Optics covers the theoretical foundations and design methods of nonimaging optics, as well as key concepts from related fields. This fully updated, revised, and expanded Second Edition: Features a new and intuitive introduction with a basic description of the advantages of nonimaging optics Aids new chapters on wavefronts for a prescribed output (irradiance or intensity), infinitesimal étendue optics (generalization of the applanatic optics), and Kühler optics and color imaging incorporates new material on the additional semi-transparency (SBS) design method in 3-D, integral invariants, and étendue 2-D Contains 21 chapters, 24 fully worked and several 12-point problems, and 1,300+ illustrations, including photos of real devices Addresses applications ranging from solar energy concentration to illumination engineering Introduction to Nonimaging Optics, Second Edition invites newcomers to explore the growing field of nonimaging optics, while providing seasoned veterans with an extensive reference book.

This book illustrates the theoretical foundations and applications of photovoltaic systems, such as on-grid and off-grid system optimization design. The emphasis is on wavefronts for a prescribed output (irradiance or intensity), infinitesimal étendue optics (generalization of the applanatic optics), and Kuhler optics and color imaging. New material on the additional semi-transparency (SBS) design method in 3-D and integral invariants, as well as étendue 2-D is covered in two new chapters. Throughout the book, the authors present the material in a clear, logical sequence, starting with the fundamentals of nonimaging optics and progressing to advanced topics. Each chapter is written by an expert in that area, giving the reader an up-to-date overview of the subject. Both the experimental and theoretical aspects of each topic are presented.

Solar Energy DeSalination Technology explains how to obtain clean water from sea water using solar energy. Special methods and types used in solar desalination are introduced, providing new thoughts, concepts, and feasible solutions in the desalination field, along with the thermal and economic efficiency relating to current technology. Many places in the world are suffering from fresh water shortage. However, those places are often rich with solar resources, sea water, and/or brackish water resources that could dramatically benefit from solar energy as a viable solution for the production of fresh water. Explains the principles of solar thermal energy usage to produce clean water from sea water, and introduces and explains new kinds of solar desalination systems, including their technical level and working principle Provides fundamental knowledge on water treatment and solar collection.

Solar cooling is most effective where it is most needed – in the tropics. Most developing countries lie in the hotter parts of the world, and the need for clean and affordable cooling, especially for the health and safety of vulnerable populations, is critical. Paradoxically, solar air-conditioning can contribute significantly to the alleviation of the problem.

This book provides a comprehensive look at the science, methods, and limitations of nonimaging optics. It begins with an in-depth discussion of thermodynamically efficient optical designs and how they improve the performance and cost-effectiveness of solar concentrating and illumination systems. It then moves on to issues involving concentration, imaging devices and their limitations, and the theory of fuses and its applications to optical design. Numerous design methods are discussed in detail followed by chapters of estimating the performance of a nonimaging concentrator and pushing their limits of concentration. Exercises and worked examples are included throughout.

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Increasing the performance and durability of the systems. This Special issue on research on solar collectors presents some recent developments and studies on tracking solar collectors for medium- to high-temperature applications, both line- and point-focus systems, conceived for the supply of heat in industrial processes, to provide thermal energy to a power block for electricity production, or even to combine heat and electricity generation in a solar collector unit (CSP/CPV). The articles included in this Special issue cover theoretical or practical issues on geometrical optics, thermal-hydraulic modeling, and performance analysis, focusing on the following topics:

- Solar towers: heliostat fields analysis and optimization
- Solar towers: heat transfer media studies
- Parabolic troughs: evacuated solar receivers analysis and thermal-hydraulic modeling
- Fresnel reflectors: geometrical optics and manufacturing issues
- Fresnel lens in CPV
- Energy losses in solar collectors systems

This volume constitutes the refereed proceedings of the 4th IFIP WG 5.4 Working Conference on Computer-Aided Innovation, CAI 2011, held in Strasbourg, France, in June/July 2011. The 14 revised papers presented were carefully reviewed and selected from numerous submissions. They cover a broad range of topics from basic research to industrial applications of computer-aided innovation systems.