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OPTOELECTRONIC DEVICES AND OPTICAL IMAGING TECHNIQUES

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This book is dedicated to Milton Paul Daniel

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Preface

The technology of optoelectronics, which deals with devices combining optical and electrical ports, has expanded enormously in the past few years, as a result of the rapid expansion of the semiconductor industry. Some optoelectronic devices, such as the light emitting diode or LED, have found their way into the majority of electronic appliances manufactured today. This rather radical change from tungsten filament light sources, producing more heat than light, to LEDs producing highly coloured or monochromatic light, has taken place almost without comment.

The fact that the present age could be described as the era of the crystalline semiconductor is reflected in the variety of optoelectronic devices. Almost every function which formerly required expensive photosensitive or photoemissive devices operating at high voltages, can now be accomplished with an inexpensive semiconductor device requiring a few volts. The photomultiplier tube can be replaced by the photodiode/operational amplifier; the gas laser by the laser diode; the cathode ray oscilloscope by the LED display; the television camera by the charge coupled device area sensor; and they can all be powered by another optoelectronic device, the solar cell.

This book is written in a spirit of excitement and wonder at the ingenuity of man to develop new solutions to old problems. It is hoped that the reader may sense some of the author's enthusiasm, and may even be carried away to develop his own interest in optoelectronics. The book is written at a level which should be accessible to the undergraduate student with some understanding of semiconductor physics and electronic circuits. The more difficult topics in the book are included for completeness and for the reader who wants to develop more than a superficial understanding.

The devices described here reflect the author's interests and are not meant to provide an encyclopedic coverage of the subject. None the less, it is hoped that a representative collection of devices has been included, and that these will maintain their importance in the future. It is the task of the present generation of engineering and physics students to solve some of the many problems hinted at here; this is, after all, only a beginning.

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DOUGLAS A. ROSS