THE REMOTE SENSING SOURCEBOOK

D. J. Carter

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A guide to remote sensing products, services, facilities, publications and other materials

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FOREWORD

It is the purpose of this book to provide a clarification of the organisational structure of remote sensing activity in the UK and to give a basic outline of the products, services, facilities and publications that are available. The need of teachers, lecturers, advisers and other members of the educational community for a basic orientation in this field has been the prime concern in compiling and editing the contents. It is not intended as an encyclopaedic directory for specialists and professionals in remote sensing, although it is hoped that some of them may find this a useful summary. Image processing and other quantitative analytical methods and equipment are therefore given only relatively brief treatment.

Although the emphasis is on products, publications, services and facilities in the UK, it would be unrealistic, and arbitrary, to confine this guide to a British context alone. Remote sensing, particularly from space, has an international dimension, and progress in the UK has been wholly dependent on access to data provided via American and European networks and agencies. Imagery archives, publications, etc. that are readily available from these sources are therefore acknowledged. For the same reason, texts, audio-visual resources and maps published overseas are also included on a selective basis.

Space has prevented the inclusion of review comments on all published texts and other resources, although an indication is given of those products which have been widely adopted or which offer flexibility in their use as teaching and learning materials. Detailed reviews of many of the books and some of the audio-visual resources have appeared in journals and newsletters that are listed later in the Technical Literature section.

Details are correct at the time of going to press; any inaccuracies are the responsibility of the author, who would be pleased to receive details of omissions and errors that may be apparent to readers. The Addenda lists information that became available after the final proof copy of the text had been completed.

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D. J. Carter

Havant, Hampshire
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To avoid repetition, the addresses of organisations having several entries are given only once. The relevant page is underlined in the Index.

Part I
An Overview of Remote Sensing Activity

PART 1.1: AN INTRODUCTION TO REMOTE SENSING

This brief summary of the main concepts and methods of remote sensing is designed to give basic orientation for readers without pre-existing familiarity with this field. It will also serve to introduce the main remote sensing programmes and sensor types that are used without further explanation in the text. The list of abbreviations given later should be consulted for additional clarification.

A comprehensive and literal definition of remote sensing is the observation and measurement of the attributes of objects, independent of direct physical contact. As this embraces fields of investigation as diverse as radio astronomy and forensic medicine, it has been reduced in scope to provide a manageable context. In the environmental sciences, remote sensing is understood as the acquisition, recording, processing and classification of data obtained through the use of electromagnetic radiation sensors. The latter may be fixed or mobile ground based systems or accommodated in aircraft, helicopters, rockets, spacecraft or orbiting Earth satellites. In the popular imagination, remote sensing is often equated with space-borne measurements of the Earth's atmosphere, and land and water surfaces. However, these techniques have also been very successfully deployed on deep space planetary missions since the early 1970s.

Sensors adapted to certain parts of the electromagnetic spectrum are not the only types available. Useful environmental data may be obtained from the exploitation of acoustic wave and force fields, and from sensors that are not designed to produce any form of imagery from their fields of view. These are, however, excluded from the scope of this guide.

Electromagnetic radiation occurs as a continuum of wavelengths and frequencies (FIG 1). Those most commonly used in operational remote sensing are in the visible and near infrared waveband (0.4-1.1μm); infrared, including thermal infrared, (3-14μm) and microwave (1-500mm). The amount, and characteristics of, radiant energy reflected and emitted from the Earth's varied surface cover depends on the physical and chemical characteristics of specific objects. Sensor systems designed to record this within one or more defined wavebands, are known as passive. Those systems (of which radar is the best known) that use artificial electromagnetic energy sources as the basis for image construction are referred to as active. There are a large number of concepts and terms that describe the energy radiated from any object or set of objects within a unit area. That of radiance is the most important, as it quantifies the amount of energy radiated and recorded by a sensor within a given observational 'window'.

Visible light and near infrared radiation, reflected by objects at the Earth's surface, can be recorded on photographic film, and both vertical and oblique aerial photos constituted the dominant remotely sensed image product up until the mid-1960s. Thereafter, increasingly more versatile and sensitive non

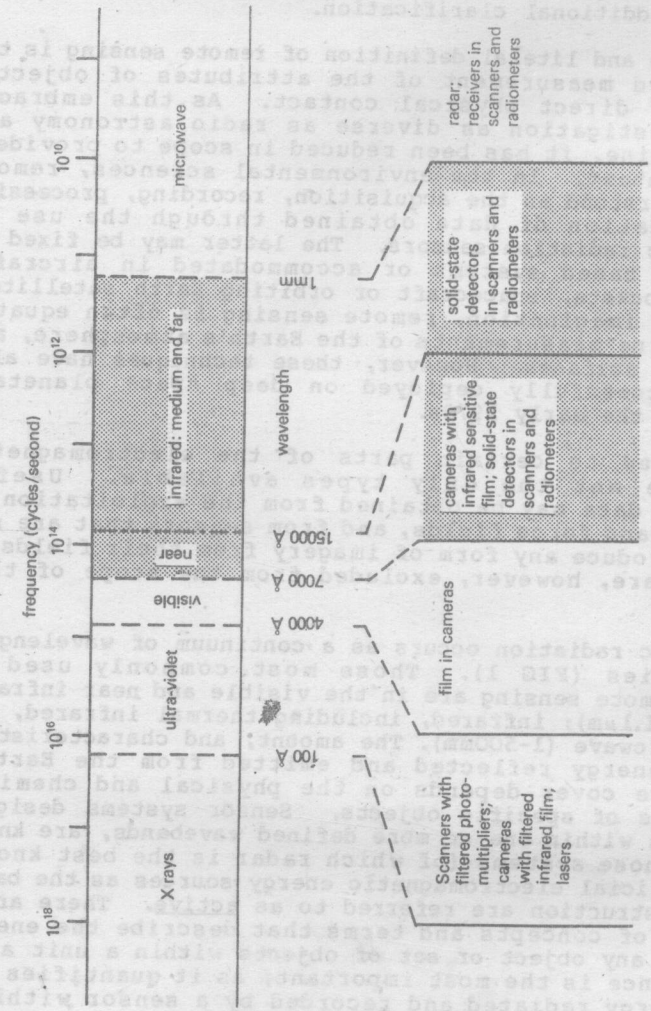

Figure 1. The electromagnetic spectrum and some common sensors that use it (adapted from Holz, 1973).