TOPICS IN REMOTE SENSING

Archaeological prospecting and remote sensing
TOPICS IN REMOTE SENSING

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1 Physical Principles of Remote Sensing
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Archaeological Prospecting and Remote Sensing

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## CONTENTS

Preface ................................................................. xiii

1 Archaeological prospecting ................................. 1
1.1 Why prospecting? ........................................... 1
1.2 Methods ..................................................... 2
1.3 Aims .......................................................... 3
1.4 The archaeological site as a physical phenomenon 4
   1.4.1 The buried structure ............................... 4
   Notes ....................................................... 7

2 Soils and the effects of climate on prospecting .......... 9
2.1 Introduction ............................................... 9
2.2 Macroscopic characteristics .............................. 9
   2.2.1 Granulometric analysis ............................ 10
   2.2.2 Soil differences in detectable archaeological features 12
   2.2.3 Soil water ........................................... 14
   2.2.4 Ions in the soil ..................................... 18
   2.2.5 Parameters defining the state of a soil ........ 18
2.3 The electrical conductivity of soils ..................... 19
   2.3.1 Dielectric permittivity of soils ................. 20
2.4 Thermal properties of soils ................................ 22
   Notes ....................................................... 25

3 Aerial photography ............................................. 26
3.1 Introduction ............................................... 26
3.2 The appearance of archaeological sites from the air 28
   3.2.1 The high viewpoint ............................... 28
   3.2.2 The targets ('signals') ......................... 30
Contents

3.2.3 ‘Noise’ 30
3.2.4 Aims in archaeological aerial photography 31
3.3 Crawford’s site classification 33
  3.3.1 Shadow sites 33
  3.3.2 Soil sites 37
  3.3.3 Moisture markings 46
  3.3.4 Frost and snow marks 48
  3.3.5 The crop site 50
  3.3.6 Soil water balance 58
  3.3.7 Kinds of soil and their effects 74
  3.3.8 Spectral properties of vegetation 75
3.4 Cameras and films 77
  3.4.1 Historical note 77
  3.4.2 Lenses and filters 79
3.5 Photographic film as a detector and information carrier 88
  3.5.1 Introduction 88
  3.5.2 Physics, chemistry and engineering of films 89
  3.5.3 Density and exposure 92
  3.5.4 Colour 105
  3.5.5 Image structure 112
  3.5.6 Dimensional stability of negatives and prints 116
  3.5.7 Archive quality 119
Notes 122

4 Archaeological image enhancement 126
4.1 Introduction 126
  4.1.1 Images as information records 126
  4.1.2 Some photographic preliminaries 128
4.2 The image as numerical data 132
  4.2.1 Getting a picture into the computer 132
  4.2.2 The digitised picture 143
  4.2.3 Picture output: displays, film writers 145
  4.2.4 Software 149
4.3 Elementary statistical properties of images 150
4.4 Mathematics of image analysis 153
  4.4.1 Representation by means of orthogonal functions 153
  4.4.2 The point spread function 156
  4.4.3 Filtering 161
4.5 Enhancement of archaeological images 162
  4.5.1 Correction of errors of exposure and development 162
  4.5.2 Problems with image sharpness 177
  4.5.3 Faults due to handling and storage 190
Contents

4.5.4 Converting grayscale pictures to drawings (edge extraction) 194
4.5.5 Enhancement methods for colour pictures 197

4.6 Some practical considerations in picture processing 199
4.6.1 Computational feasibility of enhancement methods 199
4.6.2 Order of operations on pictures 202
4.6.3 Storage reduction 203
4.6.4 History of treatment 203

Notes 204

5 Geometric transformation of archaeological aerial photographs and mapping 207
5.1 Introduction 207
5.2 The image as a projection 208
5.2.1 Perspective 208
5.2.2 Maps 209
5.2.3 Transformation of sites from photographs to maps or orthophotos 209

5.3 Mathematics of picture geometry 210
5.3.1 Scanned image rectification 210
5.3.2 A mathematical model of projection in a camera 215
5.3.3 The collinearity equations 217
5.3.4 Simple methods for transposing points from a single image to a map 218
5.3.5 Optical rectification of oblique images 222
5.3.6 Computer methods for single images 224
5.3.7 An example of rectification in hilly terrain with different methods 238
5.3.8 Computer methods for multiple images 242
5.3.9 Solution of the non-linear equation systems 257
5.3.10 Determination of ground coordinates for a point in two images 268

5.4 Errors 271
5.4.1 Sources of error 271
5.4.2 Numerically unfavourable cases 274
5.4.3 Comparison of the methods with regard to error 276

5.5 Ground height 276
5.5.1 Computing a digital terrain model 276
5.5.2 Other terrain models 279

5.6 Digital photomosaics 280
5.7 Miscellaneous practical recipes 287
5.7.1 Control point methods 287
5.7.2 Hand tracing of archaeological features 287
5.7.3 Trade-offs between scanning and computation times 288

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## Contents

5.8 Maps and picture processing
  5.8.1 Map availability and scales 288
  5.8.2 Processing scanned maps 289
  5.8.3 Map storage reduction through coding 293

5.9 Incorporating non-pictorial information in images
  5.9.1 Storing and finding political boundaries and place names 298
  5.9.2 The geographic data header 299
  5.9.3 Scanned symbols and fonts 300

5.10 Fortran function for rapid determination of presence of a coordinate point inside or outside a polygon 300

Notes 303

6 Resistivity prospecting

6.1 Electric currents and soil resistivity 307
  6.1.1 Theoretical introduction 307
  6.1.2 Properties of quadrupoles 312
  6.1.3 Organisation of measurement technique for profiles and mapping 324
  6.1.4 Electrical sounding and interpretation of stratification 327

6.2 Practical aspects of electrical prospecting 335
  6.2.1 Speed of measurement 335
  6.2.2 Measuring instruments 336
  6.2.3 Electrode systems 339
  6.2.4 Automation of the measurement technique and the data treatment 342

6.3 Problems in electrical prospecting 345
  6.3.1 Instrumental errors 346
  6.3.2 Parasitic electrical phenomena 348
  6.3.3 Topographic and surface effects 349
  6.3.4 Resistivity paradoxes 350
  6.3.5 Climatic effects 350
  6.3.6 Superposition of superficial and deep anomalies 358

6.4 Structures of different types 359
  6.4.1 Conductive structures 359
  6.4.2 Resistive structures 362
  6.4.3 Unusual structures and unconventional procedures 368

6.5 History of the application of resistivity methods 371

Notes 372

7 Magnetic properties of soils

7.1 Introduction 375

7.2 Some magnetic preliminaries 375
  7.2.1 Magnets and magnetic fields 375
7.2.2 Kinds of magnetism
7.2.3 Dilution factor
7.2.4 Parent material
7.2.5 Estimates of dilution factors
7.3 Soil magnetism research
7.4 Minerals with magnetic properties in soils
7.4.1 Magnetite
7.4.2 Maghaemite
7.4.3 Haematite
7.4.4 Grain size effects
7.4.5 Time dependence
7.4.6 Dilution effects and field dependence of viscosity
7.5 Depth dependence of magnetic properties: the Le Borgne effect
7.5.1 Soil heating to determine fractional conversion
7.6 Measurement of the magnetic properties of soils
7.6.1 Sample taking and preparation
7.6.2 Measurement of susceptibility and viscosity
7.7 Conclusion
Notes

8 Magnetic prospecting
8.1 Prediction of magnetic anomalies
8.1.1 Introduction
8.1.2 Calculation of the anomaly due to objects of arbitrary shape
8.1.3 Feature shapes and the perturbed field
8.1.4 Soil noise and other sources of disturbance
8.2 Magnetometers
8.2.1 Introduction
8.2.2 The free precision proton magnetometer
8.2.3 The fluxgate gradiometer
8.2.4 The optically pumped magnetometer
8.2.5 Electron spin resonance devices (Overhauser–Abraqam effect)
8.3 Some practical considerations for magnetic measurements
8.3.1 Use of absolute, differential and gradient magnetometers
8.3.2 Position control
8.3.3 Data recording
8.4 Treatment and display of archaeological magnetic data
8.4.1 Complexity of archaeological features
8.4.2 Numerical range and accuracy of data
8.4.3 Spatial frequency content
8.4.4 Quantity of data for adequate sampling and site size
8.5 Treatment of magnetic data prior to display 491
  8.5.1 Flagging and replacing missing data 491
  8.5.2 Linear filtering 492
  8.5.3 Reduction to the pole 493
8.6 Data display techniques 495
  8.6.1 Contour plots 495
  8.6.2 Overprinting or symbol plots 495
  8.6.3 Dot density plots 496
  8.6.4 Isometric line traces 498
8.7 Treatment of archaeological magnetic data as images 500
  8.7.1 Hardware requirements 500
  8.7.2 Techniques of enlargement 501
  8.7.3 Techniques of data range compression 504
  8.7.4 Compression by linear transformation 506
  8.7.5 Mean/standard deviation normalisation 506
  8.7.6 Median/interquartile difference normalisation 506
  8.7.7 Operations on the data after picture transformation 506
8.8 Historical note: The development of magnetic prospecting in archaeology 513
  Notes 516

9 Electromagnetic prospecting 520
9.1 Definition and general concepts 520
  9.1.1 Skin depth at low frequencies and sounding techniques 522
  9.1.2 Types of sources or signals utilised at low frequencies 523
9.2 Research into applications of low frequencies in archaeology 525
9.3 Utilisation of sources at a great distance 526
  9.3.1 Surface fields in a homogeneous soil created by a distant transmitter 526
  9.3.2 The case of a two- or three-dimensional buried structure 526
  9.3.3 The SGD method 531
  9.3.4 The magneto-telluric method 541
9.4 Utilisation of magnetic dipoles: the Slingram method 541
  9.4.1 The response of a homogeneous soil in the presence of a magnetic dipole 541
  9.4.2 The case of a buried structure 546
  9.4.3 Defining optical characteristics of a prospecting device 547
  9.4.4 Examples of the use of the method 551
  9.4.5 Interest and limits of the Slingram method 562
9.5 Emission of pulse signals 566
  9.5.1 Measurement principles 566
  9.5.2 Utilisation of pulsed transmission 568
## Contents

9.6 Detection of metal objects  
9.6.1 General principles  
9.6.2 Detection of metal objects and archaeological prospection  
9.7 Soil radar  
9.7.1 The dielectric permittivity of soils and the attenuation factor  
9.7.2 Methods of measurement and interpretation of results  
9.7.3 Examples of soil radar surveys  
9.7.4 Airborne radar  
9.8 Appendix: The finite element method  
Notes  

10 Thermal prospection  
10.1 Introduction  
10.2 Soil temperature  
10.2.1 Surface temperature, temperature profile and temporal change  
10.2.2 Surface energy balance  
10.2.3 Heat flow in the ground  
10.3 Thermal anomalies and choice of favourable measurement time for bare soil  
10.3.1 Effects due to microrelief  
10.3.2 Effects due to inhomogeneous subsoil  
10.3.3 Choice of the optimal measurement time  
10.4 Use of a scanning radiometer  
10.4.1 Radiometric measurement of temperature  
10.4.2 The scanning radiometer  
10.4.3 The ARIES radiometer  
10.5 Examples of thermal prospecting on bare soils  
10.5.1 Localised structures  
10.5.2 Old field boundaries  
10.6 Thermal anomalies from vegetation  
10.6.1 A site at Villeneuve La Guyard (Yonne)  
10.6.2 A site at Maisy (Aisne)  
Notes  

Index
PREFACE

There are a number of books which have been written by physicists for archaeologists describing advances in the application of physical methods to archaeological problems. There are a much larger number of books written by archaeologists describing the results obtained in the detection and mapping of archaeological sites through the application of remote sensing techniques. To our knowledge, there are no books written for those trained in the physical sciences which provide detailed information on the theory and practice of archaeological prospecting as remote sensing is called in Europe. This book is designed to fill that gap. It has been written by a team composed of an archaeologist, two geophysicists and an applied mathematician. Its goal is to present a systematic outline of the physical and mathematical principles lying at the roots of most of the currently employed methods and to describe how advances in the newly developed discipline of image processing can aid in the preparation and interpretation of results. It also aims at collecting the widely scattered literature of the field and summarising what the authors consider to be the most important contributions in one handy volume. We are most indebted to Cambridge University Press and especially to its science editor Dr Simon Mitton for giving us the opportunity to place this work before interested physical scientists. They will be aiding the archaeologists of the future, and it is also for those younger archaeologists whose training in mathematics and physical science permits them to profit from its content.

This book summarises the work of nearly four decades of research at the laboratories of the authors and elsewhere. It would not have been
possible without the contributions of many collaborators and students. Some have now gone on to high positions in other branches of research. It has been a truly international effort, as can be judged from the three nationalities of the four authors, the fourth nationality of the editor and publisher and the many nationalities of their collaborators and students over the years.

The long term collaborators of the first author at Bonn, Aribert Landers, Bernd Weidner, Ian Graham and Waldemar Freund were responsible for much of what is described here. Irmela Herzog, the fourth author, has been with the first author since her high school days. Students from outside Germany who made important contributions while in Bonn were, in roughly chronological order: John Mudie, Ian Black, David Gubbins, David Bew, Ian Cunningham, Guy Abu Khalil, Mohamed El-Tahir, Gregory Tang, David Ray, Benjamin Santillan, Mark Dean, and Connie Bennett. Thomas S. Huang played a vital role during his year in Bonn as a Humboldt Prize winner in giving our fledgling image processing system wings while Karel Segeth has made repeated contributions on his visits.

The first author was guided as a student by O. G. S. Crawford, and at the instigation of Gerhard Bersu was asked to come to Germany three decades ago by the then director of the Rheinisches Landesmuseum Harald von Petrikovits, whose vision and patience made possible all that happened afterward. He had the benefit of discussing problems as a young researcher with Emile Thellier and Eugene Le Borgne, pioneers in the study of the magnetism of clays and soils which plays such a vital role in archaeological prospecting. Thellier’s insight, guidance and material help during the early years contributed so much, and that is why the book is dedicated to his memory. Research at Bonn was financed by the Landschaftsverband Rheinland, the Deutsche Forschungsgemeinschaft, the Stiftung Volkswagenwerk, the Humboldt Stiftung, and the Deutsche Akademische Austausch Dienst.

At Garchy and Paris both the Centre Nationale de la Recherche Scientifique and the University of Paris 6 supported research over many years. The second and third author’s principal collaborators were Alain Jolivet and Jeanne Tabbagh. Students who made important contributions were Vittorio Iliceto, Serge Renimel, Nguyen Van Hoa, Yannis Sphahos, Christos Parchas, Marie-Claude Perisset, Gilles Boussuet and Michel Dabas. The third author was inspired to take up his line of research by Louis Cagniard and André Leroi-Gourhan, and the second author profited from this during their long-term collaboration.
Preface

The division of labour has been: I. Scollar conceived the book and wrote chapters 1, 3, 4, 7, and 8 and jointly authored chapters 2 and part of chapter 5. A. Tabbagh wrote chapters 9 and 10 and jointly authored chapter 2. A. Hesse wrote chapter 6, and I. Herzog wrote most of chapter 5. This division of labour reflects the principal research interests of each of us. Translation of chapters 5, 6, 9, and 10 from the original German and French versions was by the first author. Mrs Maureen Storey of Cambridge University Press edited this heterogeneous effort and has given the book unity of style as well as finding and correcting the many errors which accumulated during the long gestation period. For her sharp eye and great patience we are deeply grateful.

Irwin Scollar
Irmela Herzog
Bonn

Alain Tabbagh
Albert Hesse
Paris and Garchy
Emile Thellier
Louis Cagniard

in memoriam