

William S. Hanson
Ioana A. Oltean *Editors*

Archaeology from Historical Aerial and Satellite Archives

 Springer

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Part I
Introduction

Chapter 1

A Spy in the Sky: The Potential of Historical Aerial and Satellite Photography for Archaeological Research

William S. Hanson and Ioana A. Oltean

Abstract Aerial photography has facilitated recognition of the density, diversity and complexity of human settlement activity across the fertile lowlands of Europe over millennia, but application of the standard technique of observer-directed archaeological aerial reconnaissance is not universal for a variety of reasons. This introductory chapter highlights the considerable and largely untapped potential of historical aerial and satellite photography for archaeological area survey and landscape analysis, contextualising the examples contained in the volume, which range widely both geographically and chronologically. It draws attention to the range of archival sources available and to the additional benefits of using them, including visualisation of the landscape as it was half a century or more ago before the destructive impact of late twentieth-century development; time-change analysis of the condition of known archaeological monuments; and the discovery of archaeological sites now destroyed.

The impact of aerial photographic discoveries on British and European archaeology has already been immense. In particular, it has facilitated recognition of the density, diversity and complexity of settlement activity across the fertile lowlands over millennia, greatly extending the distribution of many site types. It has been variously estimated that something in excess of 50% of all archaeological sites in Britain have

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been discovered from the air (British Academy 2001), primarily as a result of archaeological aerial reconnaissance which has been applied both extensively and intensively since the end of the Second World War. Traditional archaeological aerial reconnaissance, now often referred to as observer-directed reconnaissance, usually involves selective oblique photography of sites identified by observation from light aircraft flying at a height of around 500 m. In that way, it provides a filtered set of glimpses of the archaeological heritage which, given the large number of variable conditions that need to be in place to reveal the remains, are made at what are often unique or unrepeatable moments in time. But some countries, even in Europe, have operated a closed-skies policy until recently or, indeed, continue to do so (such as Greece, Bulgaria and Turkey), while others impose severe bureaucratic restraints on the use of light aircraft for such photo reconnaissance. As a result, many areas of Europe, particularly in the east (see Chap. 10 by Visy, this volume), have been able to adopt this methodology fully only in recent years, and for much of the Middle East, with the notable exception of Jordan (Chap. 13 by Bewley and Kennedy, this volume), such reconnaissance still remains impossible, as for example in Armenia and Syria (Chap. 16 by Palmer and Chap. 15 by Beck and Philip, this volume).

These difficulties, or this late start, can never be entirely overcome by newly acquired imagery, even current high-resolution satellite imagery. However, historical archives of vertical photographs and satellite photography obtained for other purposes offer considerable and largely untapped potential for archaeological research. These may involve sources external to the area concerned, such as declassified military reconnaissance acquired for intelligence-gathering purposes, or those acquired internally, by state authorities or commercial companies, for mapping or other landscape survey and monitoring activities.

The comprehensive survey of Britain by the RAF at a scale of c. 1:10000 made immediately after Second World War (c. 1945–1950) is comparatively well known in the Britain, reasonably readily accessible through the relevant National Monuments Records for England, Scotland or Wales, and provides a good example of the value of such imagery (Chap. 7 by Young, this volume). Though it often goes strangely unacknowledged, this photography has been used consistently as a starting point for the assessment of the archaeological landscape in many areas of Britain. However, although numerous countries possess various collections of vertical aerial photography taken for a wide variety of purposes, with a few notable exceptions, the level of access to and use of historical archival imagery for archaeological research seen in Britain has not been reflected elsewhere in Europe, around the Mediterranean or, indeed, further afield. In Italy, there has been a long tradition of utilising such data, partly at least because of the restrictions on observer-directed aerial reconnaissance from light aircraft which were lifted only in the last decade (Chap. 8 by Tartara, this volume). Similarly, in parts of Eastern Europe such as in Hungary or Romania, where opportunities to undertake archaeological aerial reconnaissance were more limited after the Second World War, the potential of such resources was recognised and utilised by a small number of pioneers (e.g. Visy 1997 and Chap. 10, this volume; Stefan 1986; Bogdan Cătănicu 1996). The former Soviet Union carried out

systematic black-and-white aerial photography within its territorial boundaries at regular intervals during the second half of the twentieth century. Though access to this historical imagery is still largely restricted by government agencies, several archaeological projects have been able to utilise it since the early 1990s as its classification changed from 'confidential' to 'for official use only' (Chap. 12 by Batanina and Hanks, this volume).

Wherever else the technique of aerial photography was applied, however, the primary focus has been on the acquisition of new data from observer-directed reconnaissance specifically for archaeology. This is reflected in the standard textbooks on the subject from different European countries which barely mention the use of non-archaeological archival imagery (e.g. Dassié 1978; Wilson 2000; Braasch 2005).

Apart from Britain, several countries in Europe and further afield maintain their own substantial archives of aerial photographs with national coverage, as in Belgium (Belgian Royal Army Museum – Chap. 5 by Stichelbaut et al., this volume), Italy (Istituto Geografico Militare and Aerofototeca – Chap. 8 by Tartara, this volume), Israel (Aerial Photos of Israel 1917–1919 – Chap. 13 by Bewley and Kennedy, this volume) and Uruguay (Servicio Geográfico Militar – Chap. 14 by Iriarte, this volume). Elsewhere, such material tends to be more dispersed and even less well-known, as for example in Spain and Portugal (Chap. 11 by Fumadó Ortega and Sánchez Pardo, this volume) and Cambodia (Chap. 17 by Evans and Moylan, this volume), while even in countries with more centralised archives, additional imagery, particularly that acquired by commercial companies, can be widely scattered (see, for example, the account in Chap. 13 by Bewley and Kennedy of the situation in Jordan).

However, tens of millions of mainly vertical photographs of areas of Europe and much further afield, derived primarily from military sorties (mainly RFC/RAF and other Allied air forces, Luftwaffe and USAAF) taken during both the First and Second World Wars and shortly thereafter, are potentially available for consultation. Many of these photographs are housed in three major international archives. Two are located in Britain at The National Collection of Aerial Photography (formerly The Aerial Reconnaissance Archive – TARA) in Edinburgh (<http://aerial.rcahms.gov.uk>; Chap. 2 by Cowley et al. this volume) and the Imperial War Museum in London (Chap. 6 by Pollard and Barton, this volume; Stichelbaut et al. 2010). The third is housed in the National Archives and Records Administration (NARA) at various locations in the Washington D.C. area in the USA (<http://www.archives.gov>; Going 2002; Abicht 2010). This much-underused resource has been exploited by a relatively few knowledgeable academic researchers, but the potential for further analysis is extremely high. In addition to this vast historical aerial photographic resource, the 5 years between 1995 and 2000 saw the declassification of a range of US satellite photographs taken between 1960 and 1980 primarily for the purposes of military intelligence and mapping (Chap. 4 by Fowler; Chap. 15 by Beck and Philip; Chap. 17 by Evans and Moylan, this volume). This archive, which runs to approximately 900,000 photographs with a wide geographical coverage, has been made available commercially at relatively modest cost through the United States Geological Survey and can be searched and bought online.

These various sets of data have a number of particular advantages over more recent imagery (whether aerial or satellite). First and foremost, they provide a unique insight into the character of the landscape across parts of Europe and beyond as it was approximately century or more ago before the destructive impact of later twentieth century development, whether from the increasing mechanisation of agriculture, intensive industrialisation or urban expansion. Thus, in eastern Romania, various such developments have had a major impact on the survival and current visibility of archaeological sites, for example: the expansion of urban areas such as Mangalia and Galati; the construction of massive industrial complexes covering several hectares; the construction of the navigable canal between the Danube and the Black Sea; the intensification of quarrying; and the expansion of arable agriculture (Chap. 18 by Oltean and Hanson; Chap. 9 by Oltean, this volume). Similarly, in Hungary, various elements of the Roman frontier along the Danube now lie concealed under buildings and factories or have been destroyed by intensive cultivation (Chap. 10 by Visy, this volume). In Cornwall, in south-western England, the later twentieth century witnessed the widespread breaking in of moorland, a move towards deep ploughing and a considerable expansion of towns, which had a similar impact. Agricultural improvement schemes in the basalt zone in Syria have resulted in the clearance of fields, walls and cairns by bulldozing, while enhancements to the road and rail networks, and the concomitant increase in associated settlement activity, have destroyed archaeological features there (Chap. 15 by Beck and Philip, this volume). In Jordan a combination of urban expansion and agricultural development, particularly as the tapping of deep water sources has allowed expansion into previously uncultivated areas, has damaged or destroyed numerous sites (Chap. 13 by Bewley and Kennedy, this volume), while in Armenia, villages have expanded to cover archaeological features whose only record now is that depicted on declassified satellite photographs. The area of south-eastern Uruguay has changed dramatically since the 1970s with the drainage of wetland for rice cultivation (Chap. 14 by Iriarte, this volume), while in Belgium, the photographs from early in the First World War represent the landscape as it was before the devastating transformational impact of the conflict on the Western Front (Chap. 5 by Stichelbaut et al., this volume). The second half of the twentieth century in the former Soviet Union saw a substantial increase in livestock grazing, mineral exploitation, the construction of hydroelectric dams and an emphasis on intensified agricultural production, which in some cases had substantial detrimental impact on, particularly, prehistoric sites (Chap. 12 by Batanina and Hanks, this volume). Similarly, Cambodia experienced major changes to the social, cultural and physical landscape in the later twentieth century resulting in rapid development and urbanisation in many areas. More specifically, the Khmer Rouge regime brought a radical restructuring of the agrarian landscape, involving widespread destruction of field systems and topographic features that had evolved over centuries (Chap. 17 by Evans and Moylan, this volume). In all these areas, archival aerial and/or satellite photography has allowed archaeologists to turn back the clock and identify archaeological features in the landscape that have been erased both from view and from memory.

Moreover, the historic character of the imagery means that it can often provide large-scale 'snapshots' of the landscape at various points in time. This can facilitate