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Falling out of an Aircraft: Aerovisualism and the Aerial Photography of J.S.P. Bradford

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This article explores an intriguing link between modernity, colonialism, and an aerial visual perspective. The collection of J.S.P. Bradford, an archaeologist who employed aerial photographs as part of his academic work, provides a case study for the investigation into this distinctive visual practice. Aerovisualism appears to act as a persuasive means of knowing the world: ''Seen from high in the air, a district holds few secrets.'' A close analysis of images from the collection explored here demonstrates a variety of underlying concerns, which often conflict with Bradford's textual rhetoric. The relationship between aerial visuality and modernity is thus ambiguous and ambivalent, and further investigations on this practice should be undertaken.

''Only once have I nearly fallen out of an aircraft. It was not the fault of the pilot, but simply from excitement when suddenly confronted with a spectacular sight which was quite unexpected and had never been seen before. [...] Its outlines were so clear from the air that it looked as if a giant's hand had painted them across the fields for nearly a mile in length.''

J.S.P. Bradford, ''Aerial Mapping of Ancient Civilizations'' [1956: 2–71]

A series of emerging threads in the literature on colonial or postcolonial visuality hint at an intriguing link between social modernity, colonialism, and an aerial visual perspective. The representations of landscape and space in media such as painting, cartography, and aerial photography seem to gain a particular efficacy through the use of an aerovisual perspective. Aerovisualism acts as a persuasive means of knowing and understanding the world and, by implication, to control that world and its contents: ''Seen from high in the air, a district holds few secrets'' [Marcel Griaule, cited by James Clifford (1988: 68) and later Christopher Pinney (2003: 207)]. It is therefore essential to interrogate this phenomenon further: to consider the source of its efficacy, to evaluate the contexts of its practice, and to question whether it has been unique to modern colonial practice.

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This article takes one particular case study, a collection of aerial photographs, by J.S.P. Bradford, an archaeologist who during and after World War II created, collected, and published air photographs as part of his academic practice. The social significance of aerial photographs, especially of those outside a military context, has been generally under-studied and their visuality as documents all but ignored in favor of their technical achievement. As a means to approach the issues around aerovisualism, this small archive of photographs and associated documents (now in the Pin Rivers Museum in Oxford), set alongside Bradford's publications, helps frame the enquiry by looking in some detail at the particular concerns within and behind Bradford's visual practices. A close visual analysis of a series of photographs from his working collection—including vertical, oblique, and stereoscopic aerial photographs—demonstrates the heterogeneity of aerial photographic practices, and shows the variety of concerns and affects that sometimes contrast with Bradford's textual rhetoric. The analysis attempts to nuance the concept of aerovisualism, and raise the possibilities for further avenues for a critique of such visual practices.

''SO CLEAR FROM THE AIR'': COLONIALISM, MODERNITY, AND THE AERIAL PERSPECTIVE

In an essay on spatial practices of urban living, Michel de Certeau [2000] contrasts the sense of God-like certainty in viewing New York from the heights of the Twin Towers with the confusing everyday pedestrian knowledge of ''walking the city'' on the ground. This is what he calls ''pure erotics''—the exhilaration of having the city laid out below as a picture or map, as the ''lust to be a viewpoint.'' Although the thrust of his argument is toward the neglected everyday practices of the pedestrian, his comments highlight the sense of power in elevation, which is not provided by a grounded view.

This euphoria and certainty in height finds a parallel in Gustave Flaubert's accounts of his first experiences of Cairo in 1850, first highlighted by Timothy Mitchell [l988: 21]: ''I am scarcely over the initial bedazzlement . . . . Each detail reaches out to grip you; it pinches you; and the more you concentrate on it the less you grasp the whole.'' As Christopher Pinney notes in his exploration of colonial visuality,

> Flaubert contrasts a threatening experience of closeness (in which vision collapses into touch: ''it pinches you'' with the security of distances and height, which permits the detached observation of a totality ''in accordance with the laws of perspective.'' [Pinney 2003: 206–207]

This tension between two modes of experiencing place visually recalls the ''manner in which a European modernity had produced a profound cleavage between man and the world'' [*ibid*.: 207]. The Cartesian detachment between subject and object, which facilitated the scientific revolution and stimulated investigations into the nature of vision [Crary 1988; 1994], also created a cultural environment in which Flaubert and his contemporaries felt unable to

understand truly the cities they traveled to, without finding a distanced, *elevated* view over which to survey and take photographs. This response characterizes the modernity Heidegger described in *The Age of the World Picture* [Heidegger 1977]: a desire to fix knowledge of the world in the form of a picture.

But pictures may take a variety of forms. Colonial visual history is littered with many different incarnations of distanced or aerial representations: from the romanticized landscapes of the Orientalist painters, to the cold, objective authority of colonial mapping projects [Edney 1997], which in their latest incarnations took the form of massive aerial photographic surveys.

The first aerial photograph is said to have been taken by Nadar (a.k.a. Félix Tournachon) in 1859 from a balloon over Paris, around 20 years after Daguerre and Fox Talbot started producing the earliest photographs. We currently know little about early responses to this new photographic perspective. It was only with the ability to link aerial photographs to a cartographic grid through accurate photogrammetry, combined with the flexibility of more stable aircraft, that they began to be used on a large scale. The conflict that drove the development of both aerial photography and aviation concurrently—World War I—was performed as a cartographic war. Like the national posturing that first initiated it, manouvers were planned around boundaries, on incisions in the landscape that needed to be known, understood, and then controlled. Aircraft that could be flown at a steady height and speed, when fitted with cameras, allowed geometric translation from vertical photographs to accurate photographic maps of the rapidly changing battle field landscape, where landmarks were soon obliterated. Aerial photography thus began its role as a panoptic tool of surveillance in the air, and later into space, as the distance between subject (the surveyor) and object (the landscape) increased.

In this remote-controlled war in which hand-to-hand fighting and direct viewing of the enemy had been replaced by technologies of mass destruction and remote-viewing [Virilio 1989], pedestrian types of knowledge were not considered relevant. Rather as Heidegger noted, the picture itself—the map or aerial photograph—was a primary means of understanding. Knowing the enemy—like knowing the world—required distanced, geometrical, and *objectif* (i.e., lens-based) knowledge. As a mechanical means of reproducing that world, aerial photography also gave its representations of landscape a greater force of objectivity in the eyes of a viewer. The indexical relationship between the representation and the represented closed the perceptive gap between the two, such that these photographs appear more truthful [Peirce 1958]. Aerial photography, as a military technology, thus allowed the historical convergence of at least three desires in Western visuality: the desire to assume a bird's eye or God's eye view over the landscape; to see the world in a supposedly objective, empirical way; and to re-present that world as picture.

''ANCIENT LANDSCAPES'': CIVILIAN ADAPTATIONS

Following World War I, aerial photography began to be applied to a range of nonmilitary activities, including topographical surveys, urban and rural planning, and indeed academic research. Marcel Griaule's interest is well known [Pinney 2003: 207], but less frequently noted is that anthropologists such as

E.E. Evans-Pritchard included aerial photographs in their publications [Evans-Pritchard 1940: 146, Plate XVI]; and attempts to apply aerial survey to anthropology have continued intermittently ever since [e.g., Vogt 1974]. Figures such as O.G.S. Crawford, who was archaeology officer of the Ordnance Survey during the 1920s, were highly influential in introducing the practice to archaeology [Crawford 1928: 42; 1929: 44]. Since Crawford, aerial photography has come to be seen by modern archaeologists as an essential tool of empirical research, for discovery of archaeological sites and the production of maps of ancient landscapes. Indeed, it has been argued that the visuality of the aerial photograph has come to replace other archaeological conceptions of landscape completely [Stepney 2005].

The social context of these academic applications raises the question of whether they form a continuation of colonialist practices of documentation and control [Said 1978, 1993], especially in a field like archaeology in which many of the key founders had military training (General Pitt Rivers, for example). Given current postcolonial critiques, it would of course be a mistake to assume the monolithic or one-sided character of European colonialism. Only a close empirical study of the visual media produced can hope to create a nuanced understanding of the range of processes at work.

In the following sections, the collections and publications of the archaeologist John Bradford provide a case study to this effect. In what way, if any, did the practices of nonmilitary aerial photography conform to or confirm colonialist interests during the middle part of the 20th century? What does this tell us about aerovisualism more generally? Is it always and necessarily concerned with the same desires that emerge from the colonialist–modernist nexus: superiority in height, mathematical or cartographic space, and an objective or authoritative visuality?

J.S.P. BRADFORD: HIS LIFE AND COLLECTIONS

John Spencer Purvis Bradford was born on August 23, l918, and studied at Christchurch College, Oxford, just before World War II. He became involved with the archaeological circles of the university, becoming president of the Oxford University Archaeological Society [Bradford and Goodchild 1939]. During the war he was an officer in the British Air Photography and Reconnaissance Unit stationed in Italy from 1943 onward, looking through thousands of vertical aerial photographs [Radcliffe 2005: 9]. In May 1945, at a time when ''aircraft and other facilities were temporarily available'' [Bradford 1956: 2–7], he took the opportunity to capture many aerial photographs of archaeological sites, field systems, and general landscapes in Italy, as well as collecting many RAF photographs for archaeological purposes. Bradford became a university demonstrator and lecturer in ethnology at the Pitt Rivers Museum after the war, teaching and publishing on the applications of aerial photography in prehistory and anthropology. The last 15 years of his life were sadly spent in a hospital in Kent, apparently suffering from a degenerative mental illness. He died on August 12, 1975 [Radcliffe 2005, 2006].

Bradford's one major publication, *Ancient Landscapes: A Study in Field Archaeology*, was published in 1957 and was reprinted twice, in 1974 and 1980. This

book was his guidebook and manifesto for aerial archaeological practice, illustrated with many examples from his own photographic collection. The book is interesting because it was not simply as a description of method, it was also an attempt to shift archaeological research toward an appreciation of landscape by attempting to look between isolated sites, toward the gaps that traditional archaeological analysis had ignored. In many ways, although indirectly, this is a precursor of much of the interest in landscape in recent archaeological theory [Tilley 1994: xi, 221] and the popularity of regional archaeological survey [Ammerman 1981: 63–88]. ''The concept of 'ancient landscapes' as organic topographical wholes . . . involves geology at one end and poetry at the other end of the spectrum'' [Bradford 1957: 3; cited in Radcliffe 2005].

Bradford's collection of photographs was diverse and heterogeneous. Many of the photographs that he obtained in a systematic way from the RAF before destruction are now housed at Keele University, but a small selection of his own working collection for publication, teaching, and other purposes as well as a number of negatives of his own remained in the Pitt Rivers Museum Photographs and Manuscripts Collection. The assemblage of this working collection includes loose prints for study, occasionally mounted for publication; lantern slides, for teaching and lectures; loose film negatives from his Italian mission; and glass-plate negatives, which appear mainly to be copy photographs from books. The collection includes vertical, oblique, and stereoscopic aerial photographs. The geographical distribution of the photographs is similarly diverse—Bradford was interested in the worldwide application of aerial archaeology. While there are substantial numbers of photographs that he himself took in Italy, there are also those he collected in Iraq, Egypt, Burma, Siam, and China. A significant portion of the loose and mounted prints in this latter category came from two main sources: military (namely, RAF/Royal Air Force or USSAF) and commercial aerial survey companies (including Hunting Aerosurveys). There are also notes and letters of various kinds, none sorted, perhaps thrown together when Bradford's office was packed up permanently after he was hospitalized in 1960 [Radcliffe, personal communication].

THE VIEW FROM NOWHERE: VERTICAL AERIAL PHOTOGRAPHY

The vertical photograph of the type seen in Figure 1 comes from a substantial proportion of the ''Asia and Middle East'' part of Bradford's working collection. This photograph was taken by the RAF as part of their regular wartime reconnaissance missions. On it are indications of the time of day the shot was taken, the compass direction, altitude, and mission number. These features align the photograph as a form of projectionist map, recalling its objectivity and authority, and linked into a global grid of universal coordinates. The landscape here is a measured or measurable subject, to be fitted into that grid by means of mathematical adjustment. This particular photograph has no visible grid, although a diagram used by Bradford in *Ancient Landscapes* hints at this widespread practice [Figure 2]. The visuality of the photograph strongly recalls that of a map, although its relation to the depicted landscape is indexical rather than symbolic [Peirce 1958].

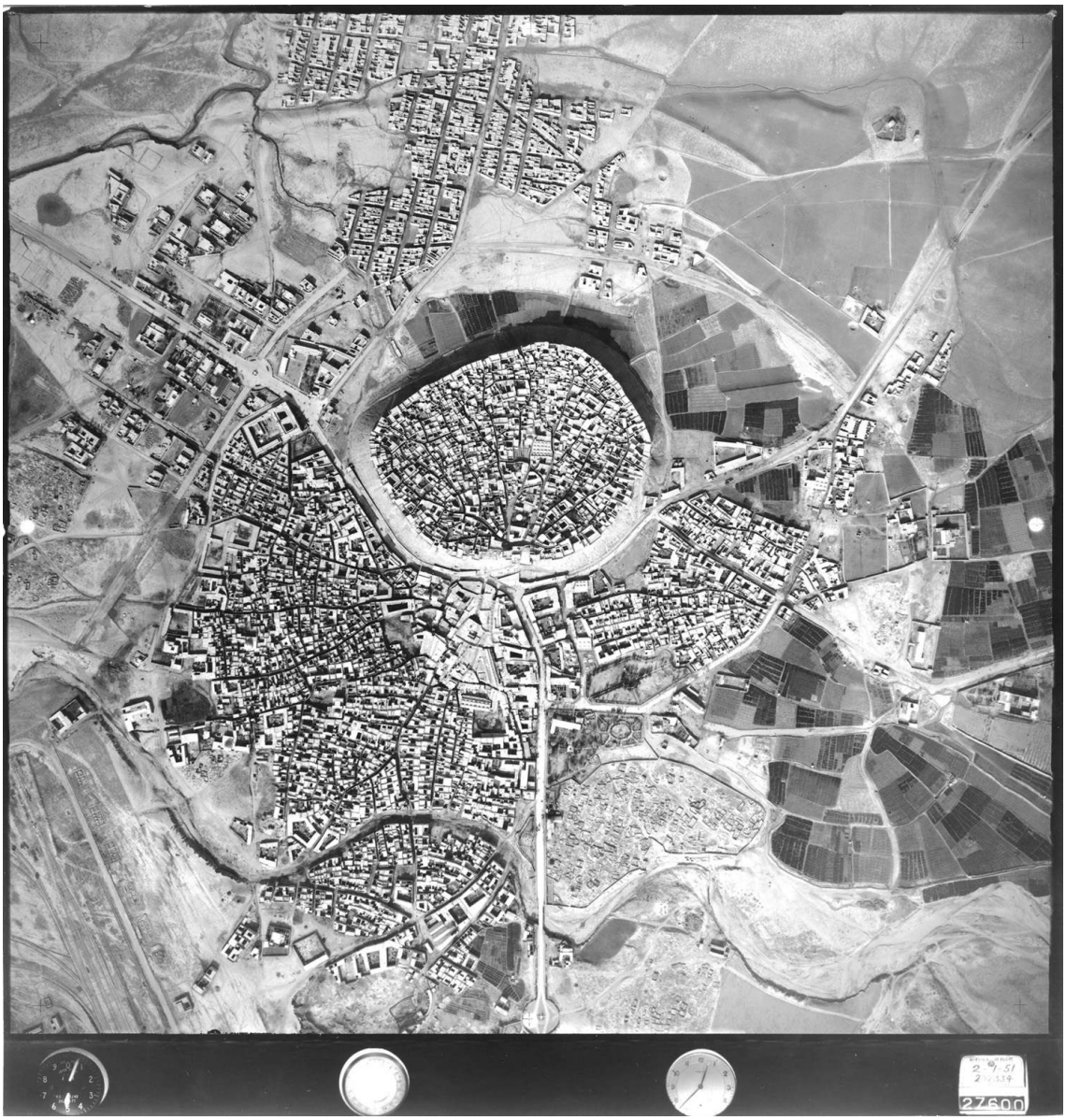


Figure 1 RAF vertical aerial photograph of Erbil, Iraq, from PRM.1998.296/Box AI.a, ''Asia, Middle East and Africa'' (Photo reproduced with permission of Pitt Rivers Museum, University of Oxford).

A considerable amount of literature has been devoted to demonstrating the intimate association of cartographic practices to colonialism [Edney 1997; Harley 2001; Pickles 2004; cf. Hsu 2004]. Many of the European topographical survey institutions, such as Britain's Ordnance Survey, were founded toward the end of the eighteenth century as mapping became the ''core of military science'' [Edney 1997: 18] and as European colonialism was gaining momentum. Accurate geometric cartography was linked to first Renaissance and then Enlightenment interest in mathematical space and its representation [Pickles 2004:128–129]. Through empirical techniques of survey such as triangulation and trigonometry, and the use of specialized instruments such as theodolites, landscapes could be

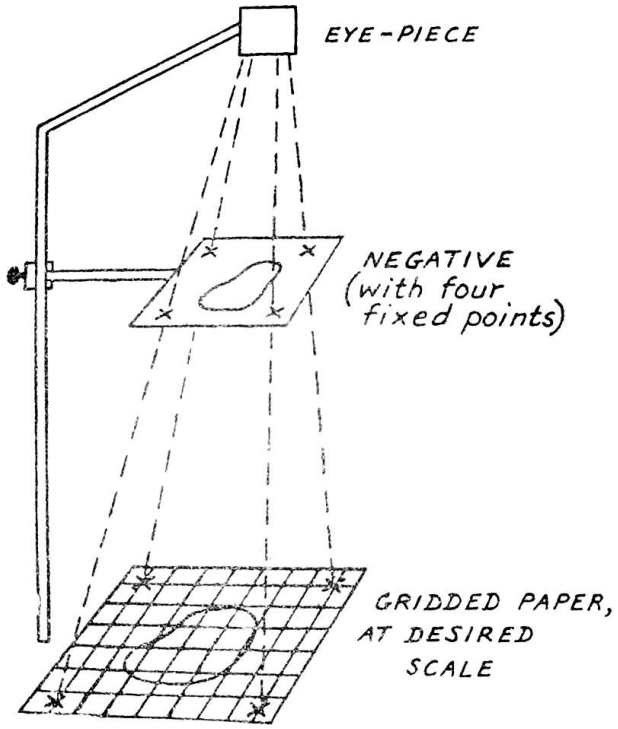


Figure 2 Diagram showing how to project an aerial photograph onto a grid [from Bradford 1957: 64].

translated first into numbers and then into visible, scaled, vertical topographic representations. Colonial maps were thus entwined in a process of control and governance of landscapes or territories, through the institutional creation of knowledge. In this context, aerial photography like that of Figure 1 appears to provide the perfection of this mapping urge: a visual representation in which the symbols of a map are replaced with the actual view from above.

But the same indexicality which appears to give the aerial photograph greater truth value and objectivity than a map alters the interpretation of this map-image. Without the pedestrian knowledge from the ground, certain specific information normally encapsulated in conventional icons and symbols, such as building functions or placenames, cannot be seen in an aerial photograph. Without comparison with already extant maps, it is difficult to read this raw image—the landscape is anonymized. The military intelligence response to this uncertainty of the aerial image was twofold. First, they produced catalog booklets and trained interpreters to classify type examples of buildings, batteries, and other features of interest to military photographic interpreters and show how they would look in a vertical aerial photograph, to aid the conversion of photograph to map. Secondly, they created labeled overlays for indicating the main features to nonspecialists, in effect creating maps out of the photographs. It is as though the photographs themselves are never enough, the indexical aerial view less useful than the symbolic version.

Bradford's published vertical photographs in *Ancient Landscapes* [for example, Figure 3], generally have the original geometric frames removed, but they display

43. ZARA. A vertical view of one of the best preserved examples of Roman centuriation in the whole of Europe. It has been discovered from air photos and forms part of the system shown also on Plate 42. This illustration covers a coastal area just south of the town (see Fig. 16). Stone walls along the roads have 'fossilized' the *limites*, and also show an original division of one *centuria* into equal squares. *Crown Copyright Reserved.*

Figure 3 Vertical aerial photograph of Roman land divisions [from Bradford 1957: plate 43].

the same interest in classification and supplementary labels in order to fix the archaeological interpretation. Something about the rawness of the photographic technique means that images must be carefully tamed with framing labels. Without the labels, or some indication of where you are, the vertical aerial photograph makes the viewer feel geographically lost.

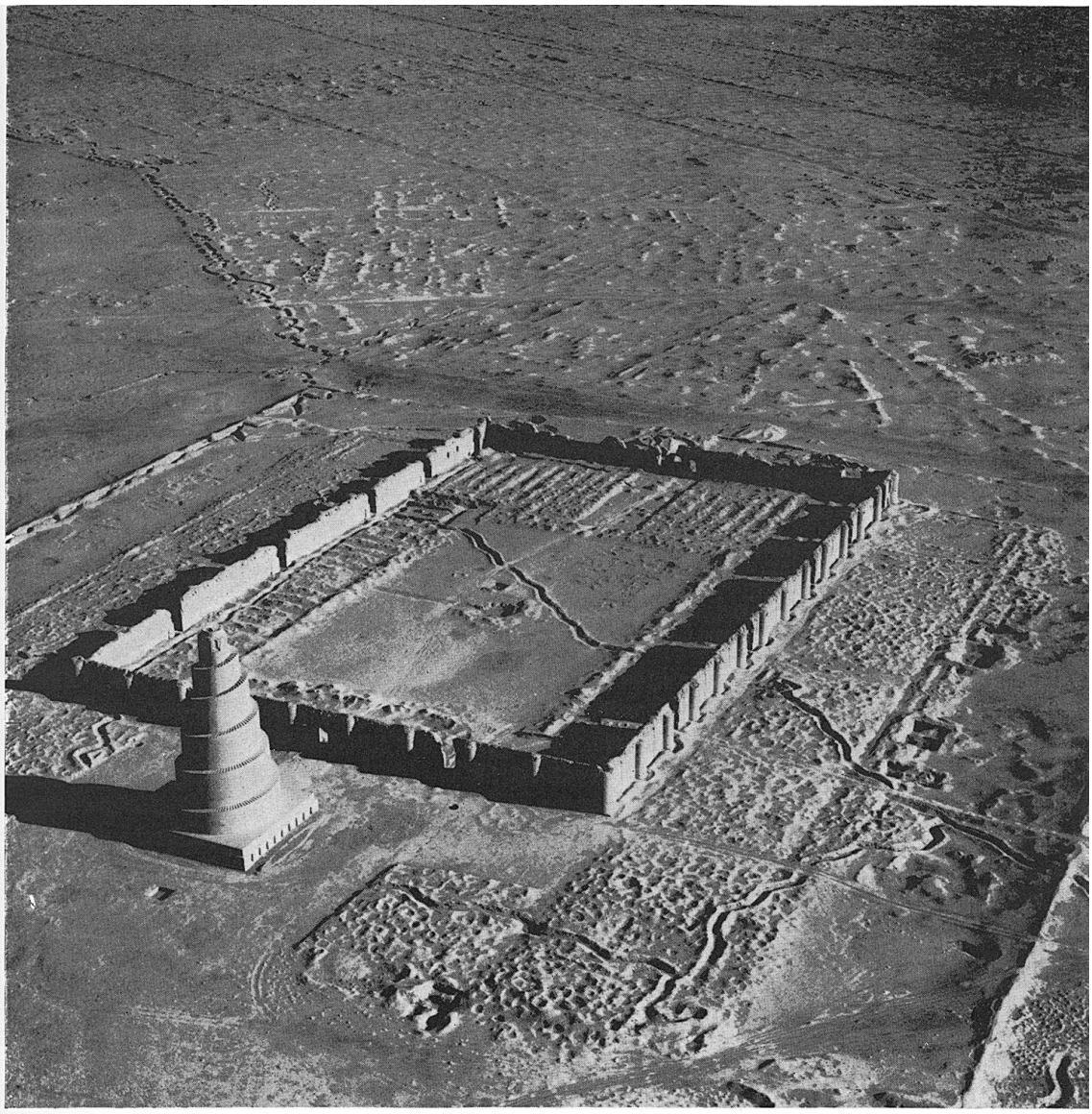
The rawness of photography leaks out in other ways as well: unlike the universal verticality of the map, in which everything is reprojected on an imaginary flat (though textured) earth, the aerial photograph is only truly vertical in one infinitesimally small point at the center of the lens, the azimuth. Looking closely at Figure 1, it is possible to see the sides of buildings as well as the roofs. Although the human assumption of an oblique elevated view has long been possible, the vertical view of the map has its origins in an imagined and arguably dehumanized visual perspective. The *ichnographic* perspective of a two-dimensional map or plan is never truly possible to adopt, even for an airborne human eye, and is thus always an abstraction. This ''net product of multiple points of view'' [Söderström 1996: 258] of flat projectionism is only simulated, although never achieved, with the distance of aerial flight and telescopic lenses.

Bradford does not see aerial photography as the only way of knowing the landscape, and accepts limitations of the technology. He tells us that after studying a series of RAF vertical aerial photographs of Cyprus, a ''tour of representative sites showed that field-work on foot and surface finds of pottery, etc., are more productive of discovery than the air view'' [Bradford 1957: ix]. Unlike the idealistic British surveyors who thought their map of India to be total and truthful [Edney 1997: 25–26], Bradford seemed only too keenly aware of the limits of the aerial eye, and was prepared to be surprised by both what is visible and what is not. The techniques of vertical aerial archaeology are similar to those of a classifying colonialist; the photograph in Figure 1 is not only useful cartographically but also attractively intricate. Indeed, the published photographs of Roman ''centuriation'' (the ancient imperial division of land depicted in Figure 3) are not simply maps of a particular land-type but also strong aesthetic images that produce a pleasurable response in the viewer.

As we will see in the next sections, the desire for taming and understanding the totality of landscape is tempered with yearning for closeness and enchantment through dramatic images. Nonetheless, Bradford strives for scientific validity in his introduction to *Ancient Landscapes*, and these vertical aerial photographs provide the strongest visual documents for a desire for scientific objectivity and totalizing coverage.

''SURVIVAL OF THE FITTEST'': OBLIQUE AERIAL PHOTOGRAPHS

The two oblique aerial photographs shown here [Figures 4 and 5] depict the great mosque of al-Mutawakkil at the ancient ruined city of Samarra in Iraq, and were obtained by Bradford from the archive of the Hunting Aerosurveys/Aerofilms company, London. In *Ancient Landscapes*, the first image [Figure 4] serves as a demonstration of the ''special place'' that obliques have ''to make manifest known sites.'' Indeed, Bradford goes on to say ''their merits are so obvious that illustrations like [Plate] 17'' [Figure 4 below] ''short-circuit further comment.'' The other, however [Figure 5], does not seem to have been published in any of Bradford's works. Although from opposite directions, it seems likely that the photographs were taken within minutes of each other, given the angle and length of the shadows cast by the mosque. The shadow direction at the site also suggests that they were taken in the



17. IRAQ, SAMARRA. An oblique view showing the remains of the chief mosque; and, in the background, shadow-relief outlines some of the straight streets in this vast ruined metropolis of the 9th century A.D.
See p. 52. *Ph. Aerofilms Ltd.*

Figure 4 Image of mosque at Samarra, Iraq [from Bradford 1957: plate 17].

evening. That the shadows are long and the contrasts of terrain exaggerated by this is not accidental: this is a common strategy of aerial archaeology [Bradford 1957: 31–41]. Clearly Bradford had access to many thousands of images, and was able to publish only a few of them. But a curious comment raises questions about the mechanism by which those few were chosen: "[T]hose that are published have been through a process of selection, the survival of the fittest; in practice there is always one position for an oblique photograph that is better than all the rest, and which can only be determined by circling the site" [Bradford 1957: 50].

For Bradford, a key task of a good aerial archaeologist is assessment of the relative visual impact of certain viewpoints over others (whether in the air or

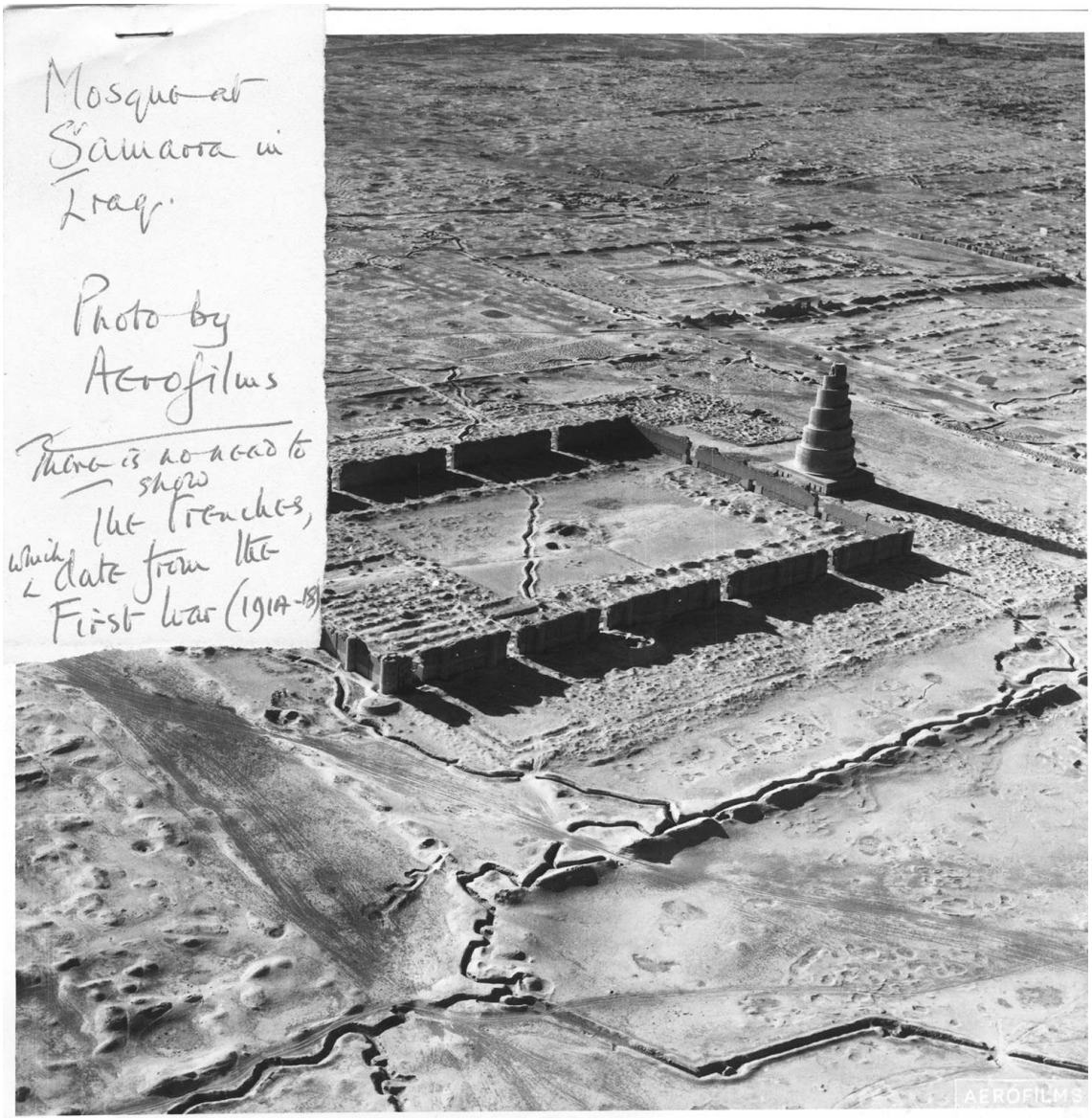


Figure 5 Oblique aerial photograph of al-Mutawakkil mosque at Samarra, Iraq, PRM.1998.296/ Box AI.a, ''Asia, Middle East and Africa'' (Photo reproduced with permission of Pitt Rivers Museum, University of Oxford).

back down in the studio) in order to get the one that is ''better than all the rest.'' Certain oblique photographs are so powerful, they may almost be allowed to speak for themselves. ''[W]hen skilfully positioned an oblique is unequalled for showing the way in which a site was fitted into the landscape'' [*ibid*. 51]. So what are the features that make for this skillful selection? No definitive procedure is provided by Bradford. He makes a few recommendations on lighting conditions, flying height (1,000 feet), and focal length (5–10 inches) as ''best for general purpose.'' But he qualifies this by saying that ''[m]uch depends on the nature and size of the [archaeological] site'' [*ibid.* 50]. For Bradford, the selection is so unconscious, the merits of a good oblique photograph ''so obvious,'' that instead we must turn back to the images themselves for clues.

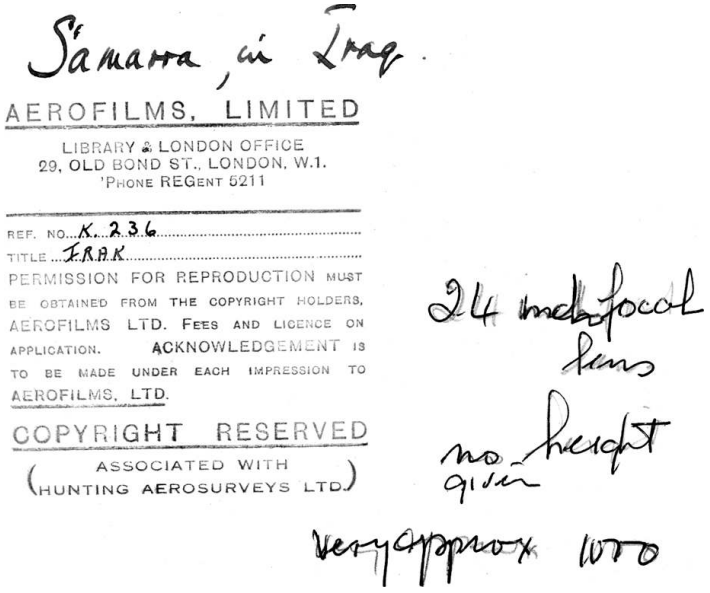


Figure 6 Reverse of Figure 5 showing Bradford's notes (Photo reproduced with permission of Pitt Rivers Museum, University of Oxford).

As both images are low obliques, lacking a horizon, neither is very useful for topographic survey [Hart 1948: 10]. Comparison with maps of the site confirm that they have not been taken on any obvious mapping axis, nor are the ''universal'' geographical coordinates and direction of each indicated on the photographs themselves or elsewhere. Although Bradford notes Figure 4 as having been ''taken from 1,000 feet with a 24-inch lens'' in *Ancient Landscapes* [Bradford 1957: 52], this may have been a guess, given the note written on the back of Figure 5, which records ''no height given'' [Figure 6]. It is thus unlikely that the purpose of either image was topographic survey, and this is not a factor in the ''skillful selection.''

In both Figures 4 and 5, the mosque is centered in a way that immediately draws attention. The lines of the mosque are diagonally angled and the vanishing point is not centered, and, because of this, both images lack symmetry. In Figure 4—perhaps partly because of the tighter frame and, more importantly, because of the angle of the vanishing point—the eye is drawn along the strong axis of walls running from the minaret to the top right of the image, extenuating the length of the mosque. By contrast, in Figure 5, the viewer's eye is more confused, and without the guidance of this clear linear axis, is tempted to wander along the deeply inscribed lines in the foreground. That this was undesirable is clear from the stapled note, written in red ink, apparently in Bradford's handwriting: ''[t]here is no need to show the trenches which date from the First War (1914–18).'' The trenches here are both distracting and inauthentic—they are uncomfortably modern.

One might suggest that Figure 4 was selected for final publication because it follows the conventions of elevated perspectival drawings, of Albertian geometry inherited from the Renaissance, rather than the more confused levels of Figure 5. Neither image attempts to fit into any universal cartographic grid, nor even to the axes of the mosque itself. But the process of selection seems to hinge on the tension

between the need to distance and elevate the photographic eye in order to contextualize and spectacularize the subject, as Bradford puts it, to ''evocatively'' depict the ''remains of streets stretching mile upon mile into the distance'' [Bradford 1957: 52], but also to get close enough to the monument to gain a detailed and intimate portrait. Put another way, there is an ambiguous desire to, on the one hand, distance and objectify the mosque and, on the other, to reach out and feel emotively inspired by detail. This tension recalls the ambiguity and ambivalence of Orientalist and colonial discourse highlighted by Homi Bhabha's demonstration of the complexity of colonial stereotypes [Bhabha 1983, 2004]. On the one hand, there is a deep curiosity about and desire to get closer to ''the Other,'' in this case an exotic ruin, a subject that was a common part of the repertoire of Orientalist paintings. Yet there is also a danger of transgression or confusion in proximity, as was experienced by Flaubert, which was noted above.

In *Ancient Landscapes* Bradford also notes a more general undesirable indeterminacy and uncertainty produced by some oblique photographs: ''obliques are capable of giving a misleading impression of natural relief (e.g., when taken at right angles to rising or falling ground, they can give an effect of total flatness).'' For these oblique aerial photographs to be effective, they must exert the right level of intimacy, distance, and clarity. Too close and the objectness of the mosque would be lost, and the viewer reduced to a mere pedestrian; too far and the mosque is crowded by the surrounding landscape and reduced to a less important role in the picture. This desire for opacity or at least fixity recalls what Benjamin described as the urge to ''get hold'' of objects through photography at close distance [Pinney 2003: 203]. At work in the unconscious selection of these oblique aerial photographs, first for distribution (by Aerofilms/Hunting Aerosurveys) and then publication (by Bradford and his publishers), is a visual schema that desires framing and representation of sites like this one in a dramatized, opaque, and pleasurable manner in order to transmit the desired message about the pictured site.

''AS IF SUSPENDED IN MID-AIR'': STEREOSCOPIC AERIAL PHOTOGRAPHS

Stereoscopic aerial photographs such as Figure 7 have greater application in topographic survey and surveillance than the average oblique, and Bradford was no doubt well aware of their importance from his Intelligence Corps work. We may reasonably assume that many of the vertical aerial photographs he had access to, and which are now in the Keele collection, were studied by him stereoscopically. For military purposes, the three-dimensional effect of a stereograph turns the flat surface of the image of two vertical photographs into a detailed record of the topography and height. Using specialized instruments, contours may be reconstructed to aide topographic survey.

Bradford makes the claim in *Ancient Landscapes* that ''[a]lmost all the work in this book has been based on stereoscopic photographs'' [Bradford 1957: 62]. His detailed attention to the practice in *Ancient Landscapes*, and the existence of a number of loose prints in his collection that could be used stereoscopically, confirms its significance. However, there are very few stereoscopic images

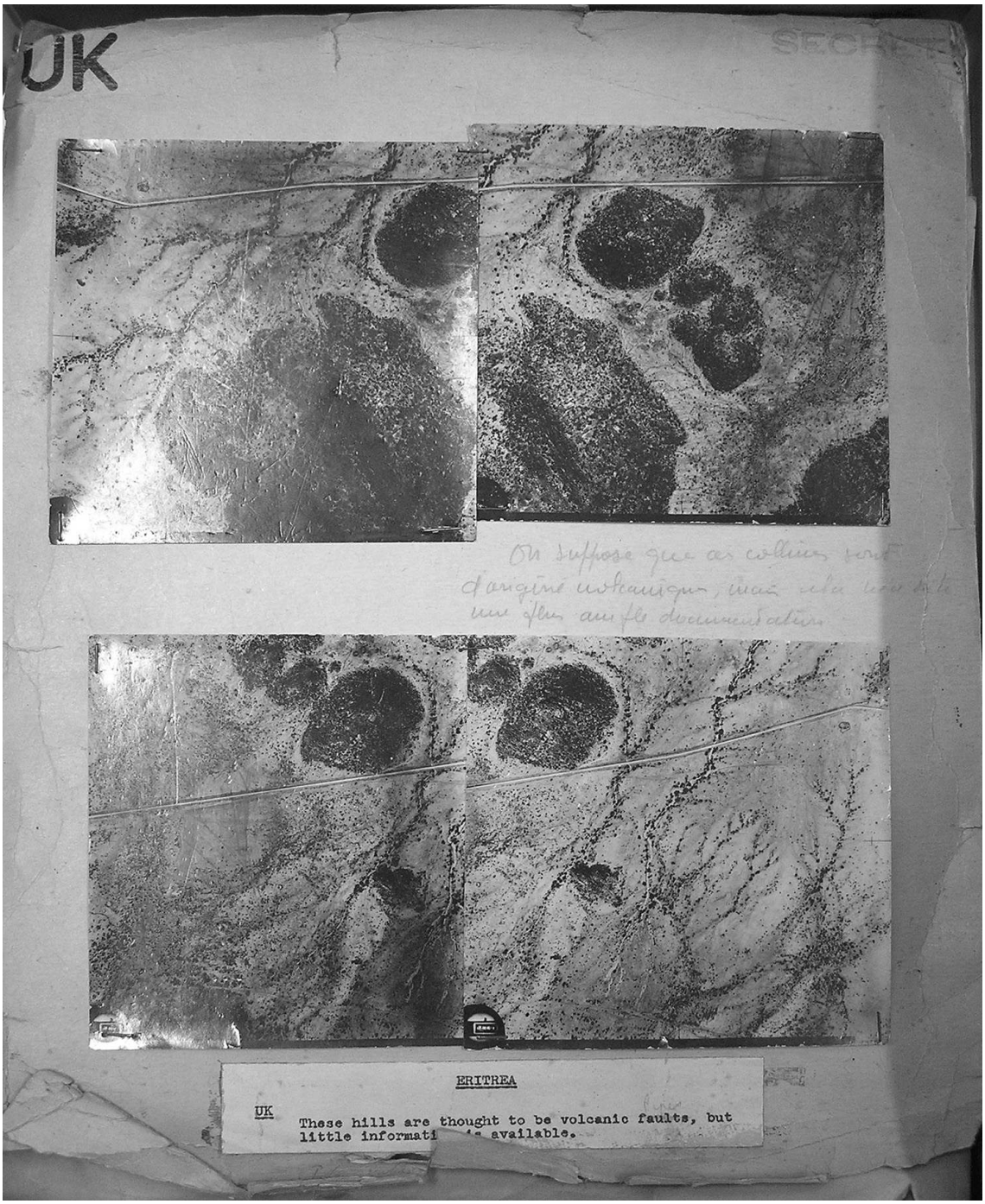
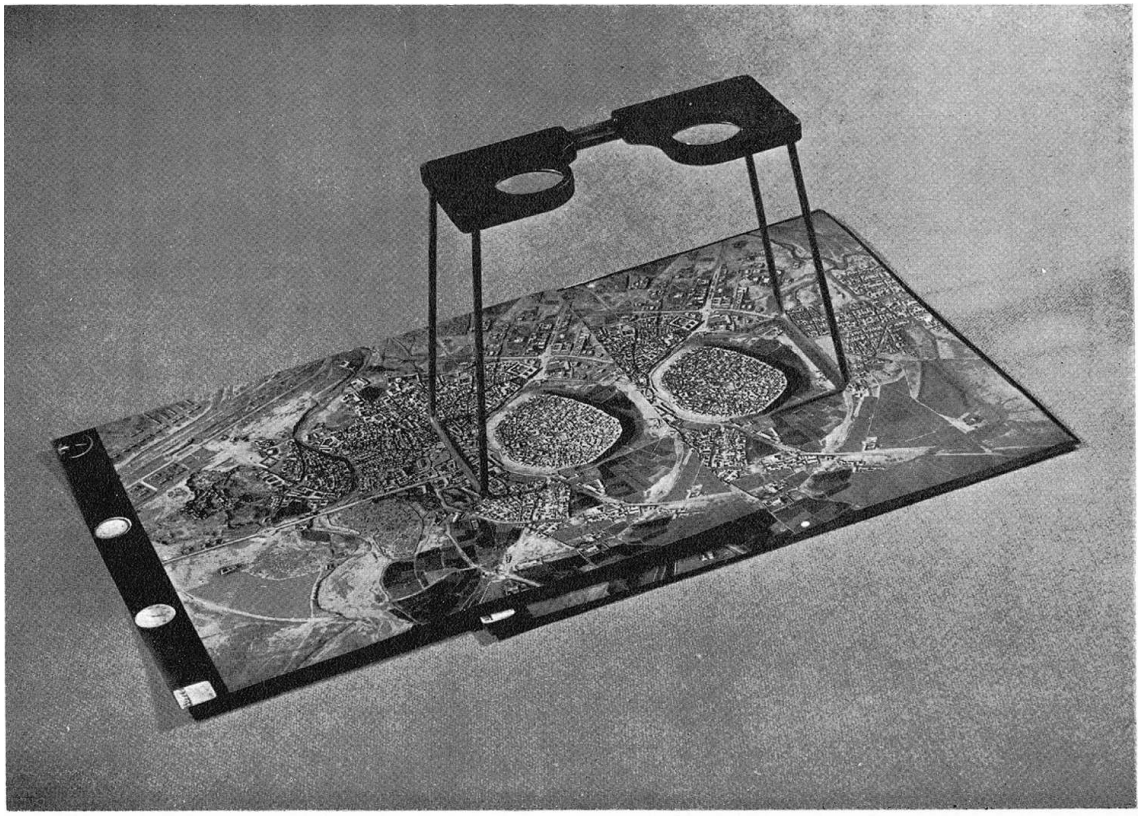


Figure 7 A page from Bradford's collections with two sets of stereoscopic pairs used for undocumented demonstration purposes, from PRM.1998.296-Box IV (Photo reproduced with permission of Pitt Rivers Museum, University of Oxford).

reproduced in *Ancient Landscapes*—indeed, only one photograph demonstrating the use of stereoscopic viewers [Figure 8] and one visible pair [reproduced as Figure 9], out of a total of 75 plate images. In an intriguing contradiction, Bradford also bemoans that it is ''the problem of communicating the effect easily in publications that tends to restrict [stereoscopy's] employment in archaeology''



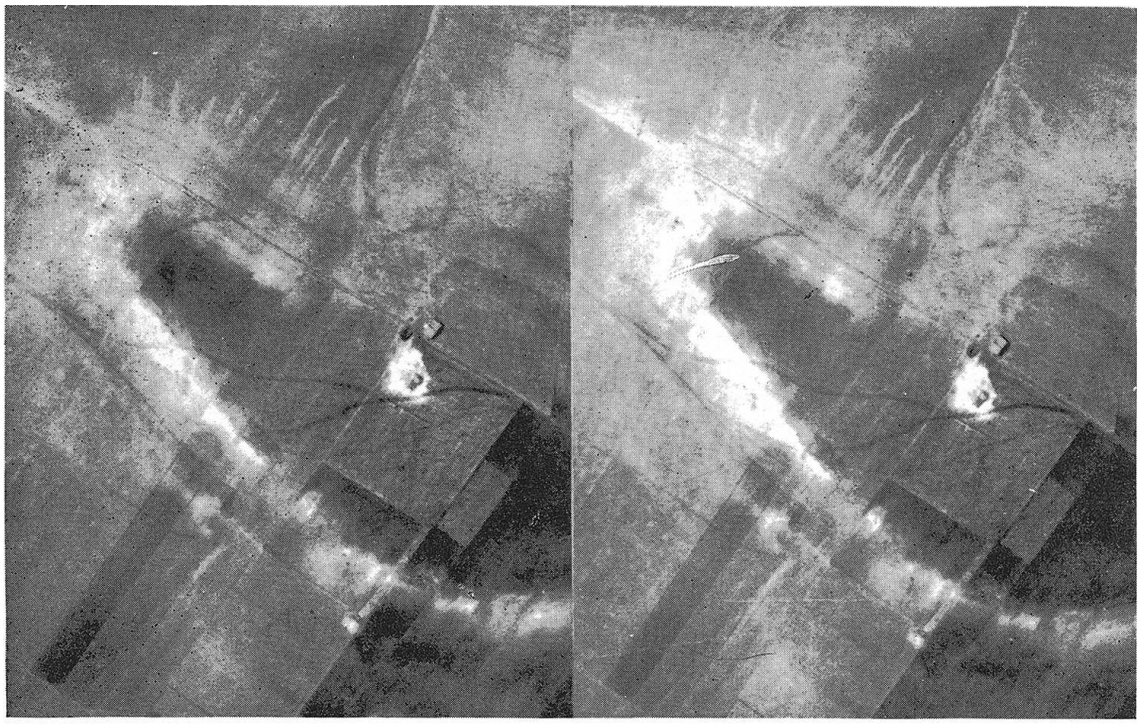
16. North Iraq, Erbil. This illustration shows two vertical photos (taken by *Aerofilms Ltd.*) placed in position for examination by a pocket stereoscope. This type of instrument is well suited to archaeological use. The 'title strip' on each photo records the altitude, time of photography, etc. Erbil is one of the oldest inhabited cities in the world. See p. 62.

Figure 8 An image from Ancient Landscapes *showing stereoscopic viewer and RAF stereoscopic pair of Erbil in Iraq (the photographs remain in the PRM collection – cf. Figure 1) [Bradford 1957: plate 16].*

[Bradford 1957: 61], but he describes methods of publishing such images with relative ease.

These discrepancies may be explained in part by reluctance on the part of the publishers to print stereoscopic pairs. Certainly there are issues of cost in a book that seems to have taken 10 years to publish [Radcliffe 2005: 12] and stereoscopic viewers are required to allow many people to view the stereoscopic effect easily. But it was not uncommon for contemporary publications such as the *Illustrated London News*, which Bradford also collected [PRM. 1998.296.97–103], to publish stereoscopic or anaglyphic photographs for a general audience, and it is therefore reasonable to expect that the readership at which the book was aimed should have access to this inexpensive equipment. The publisher's concerns also do not explain why Bradford chose the particular pair he did [i.e., Figure 8]. Another set of explanations must be sought.

A key feature of a stereograph or set of images viewed stereoscopically is that they return the viewer to a binocular being, albeit one with gigantic interocular dimensions. As Bradford puts it, the "stereoscopic impression of the earth's surface which is received is, in effect, that which would be obtained by a giant whose eyes were as far apart as the distance travelled by the aircraft between



15b. APULIA. 'Sources of error'. Parts of two consecutive vertical photos (1 : 6,000) arranged as a stereogram. This example shows that a complete and accurate interpretation of such photos makes the use of a stereoscope necessary. For an explanation of the various marks see p. 49. *Ph. Bradford, June* 1945.

Figure 9 A pair of images from Ancient Landscapes *used to demonstrate the use of stereoscopic aerial photography to help reveal topography [Bradford 1957: plate 15b].*

successive camera exposures'' [*ibid*. 62]. To obtain the stereoscopic effect for a stereoscopic pair, like those in Figures 7 or 9, viewers must decouple themselves from the normal relationship between focus and ocular convergence. Each eye must be receiving two different images but seeing only *one* three-dimensional scene while focusing at a point nearer than the two images suggest, something for which the eye must be trained or aided by specialized equipment. Indeed, Bradford was clearly keen to train his students by providing lectures with ''stereoscopic lantern slides . . . projected on to a silvered screen'' in a way that ''the audience is able, collectively and individually, to see the topographical relief of sites as if suspended in mid-air above the ground'' [*ibid*. 62].

With or without the aid of a lens stereoscope (such as is seen in Figure 8), this ''trick'' of the eye is surprising and delightful but also unnerving and nauseating. In Figure 7, as the eye settles on the correct focus and direction, the hills zoom out as tactile objects and the viewer is given the odd sense of being suspended directly above them. The hills point accusingly upward: like Flaubert's Cairo, the details come up and ''pinch you.'' The eyes required are fixed, staring, suspended in a single space, ready to fall but not falling. The viewer may be, as Bradford suggests, a giant or powerfully large being, but in the enforced stasis

there is a sense of giddiness and fragility in height that is not manifest in monocular vertical photographs and standard photographic practice. Even the visual effect itself is fragile, as moving the eyes in one direction or another brings the images crashing back down to two dimensions.

Bradford may have claimed ''limited space'' or ''difficulty in publication'' as the reasons for publishing so few stereoscopic images in *Ancient Landscapes*, but the visual giddiness of stereoscopic images also makes them less serious and academic. While for the trained viewer like Bradford, who may be used to such vertigo and learns to use the effect as a scientific tool for divination of sites, for his general archaeological audience such images would be too fascinating, too dangerously close to a frivolous parlor-room or coffee-table book to be scientific theses. The erotics of stereoscopic vision are perhaps closer to that described by de Certeau at the top of the Twin Towers in New York than the cold consideration of a topographic map. The surface of the image, the planar window that defines the image contents and separates viewer from object, is removed by the stereoscopic effect. Thus the distance and safety of a Cartesian rationalist division between subject and object is lost. In comparison with Figure 7, the image Bradford actually did choose to publish, Figure 9, is a tame and rather boring view of confusing topography.

All this suggests a fascination with the stereoscopic effect that cannot be reduced to mathematical ''precise observation'' [Bradford 1957: vii]. The giddiness and vertigo also emphasize the daring and danger of aerial photography, and of aviation more generally. Bradford may extol the abilities of aerial photography to map areas that were previously inaccessible, but to the pilots who flew the original reconnaissance missions there was always a danger of crashing, or of being shot down. Contemporary applications for aerial surveys were often turned down by colonial governments where the dangers were considered too high (*cf*. an application for help made in Aden, now held in the British Library, BL.IOR/R/20/A/3347). Flight remains a fragile technology with possible courses of resistance by local people, landscape, climate, and not a totalizing, invincible surveillance tool. The return to binocularity and enfleshed relationship to object that stereoscopic images produce may have unnerved the eye used to the hegemonic monocular perspectival ''world pictures''and explains Bradford's or his publisher's reticence in publishing freely.

INITIAL CONCLUSIONS: AEROVISUALISM AND (AM)BIVALENCE

Anne Salmond has pointed out that in ''Western'' academic and everyday language, ''height is associated with rationality, control, superiority, and power'' [Salmond 1982: 79]. Knowledge is likewise said to be ''charted,'' or ''mapped'' [*ibid*. 68–69]. The conventions of scientific rhetoric frequently hide fundamental metaphorical presuppositions behind apparently literal phrases and descriptions, and thus have considerable effect on the structure of enquiry and the understanding of the world. The potential origin of Salmond's metaphorical associations is left unexplored, however, and the evident materiality of the metaphors curiously ignored. At stake is whether these metaphorical ties

formed the basis of aerovisual efficacy, or conversely that the prevalence of aerovisual practice and material enabled this metaphorical and intellectual system to come into being. Foucault's classic analysis of panopticism offers a potential route into the materiality of this superiority of ''elevated vision.'' The power of a jailer in Bentham's perfect prison emerges from the raised and distanced perspective: of totalizing vision of the object of surveillance. But the human assumption of an ''oblique'' elevated view has long been possible through ascent to higher land, or the construction of towers, itself an ancient surveillance technology. Further cross-cultural attitudes to height and elevation and to aerovisual representations need to be undertaken to explore this theme further.

In his textual practices, Bradford is unequivocal in his belief in the benefits of aerial photography applied to archaeology. He is certain of its positive moral imperative in bettering archaeological knowledge in providing, for example, ''total mapping'' of the world. In this sense Bradford is clearly enmeshed within the modernist concerns of totalizing objective mathematical knowledge and representing the world. Perhaps unsurprisingly, he is uncritical of the military use of aerial surveillance. However, the variant forms of visuality in Bradford's collection, and the choice of photographs to use or to publish, reveal a more complex and ambiguous relationship to modernity and its visual practices. The giddiness of the stereoscopic images or the tension between distance and proximity within the choice of oblique photographs places aerial archaeology in a field of greater epistemological uncertainty. Vital to Bradford's project of aerial archaeology is the desire to be surprised, to see something new, and to view the landscape in a different way. While this search for the hidden may be similar to the military reconnaissance for batteries or enemy activity, it does not always serve the same ''colonizing'' gaze. It is not ''mathematical knowing in advance,'' but rather a search for ancient, hidden, or alternative ''grids.'' Bradford also realizes that aerial photographs are not exhaustive: they may reveal things that the pedestrian observer could not see, but the ground-level knowledge of the landscape is still required: ''every page in this book should bear the rubric: 'Please excavate''' [Bradford 1957: viii].

The idea of aerial photography as a single practice or visual style is evidently problematic when faced with the heterogeneity of Bradford's collection. What we see instead is a linked set of practices with different strategies of capture, use, purpose, and representation. The superiority of the ''aerial gaze'' which functions in these aerial photographs may have aspects of surveillance and control, but the unstated human mortality in flight reminds us of the fragility of the technology. Within Bradford's collection of photographs and his publications, there are concerns and tensions that are not related to a desire to dominate, or to know in totality, but rather to be entranced or enchanted by dramatic images of archaeological features, to be surprised and unnerved by the visions and ocular distortions, and to know monuments holistically but intimately. While some practices—for example, the vertical aerial photographs—may be closely related to cartographic knowledge, other styles of aerovisualism in this collection are less about ownership or surveillance and more about curiosity and pleasure, and even, in the case of the stereoscopic photographs, transgression of the hegemonic

regimes of photographic visuality [Jay 1998]—albeit in private, and not in publication.

This investigation into this one collection of aerial photographs has shown that there exists a plurality of ''aerovisual practices'' that need to be found and delineated, and their effects documented. For example, the role of vertical aerial photographs as scientific and objective documents emulating the visuality of maps is not shared by oblique or stereoscopic photography, whose power depends on a different set of criteria. Adopting an aerial perspective has different consequences depending on the specificity of the medium and its experience. Further investigation into aerovisualism—to include non-photographic aerial views, such as landscape painting; elevated drawings; and cross-cultural aerial images, such as early Babylonian, Chinese, or Roman maps; or book genres, such as the immensely successful coffee-table publications of *Earth from Above* by Yann Arthus-Bertrand [1999] and emulators—must take this into account.

In the modern world, aerovisualism continues to function as an institutional technology of power—for instance, in the form of CCTV or satellite surveillance—but also as a source of ocular delight, fascination and surprise. Developments in Geographic Information Systems have recently eroded further the differences between aerial photographs, satellite images, and maps; the difference between high-altitude verticals and low-altitude obliques; and even the relationship between maps and cinema [Yusoff 2005: 381–398]. Increasingly, tools such as Google Earth and NASA's WorldWind allow zooming from space down to ground-level models of buildings, potentially for the entire world. As these are integrated with ''virtual reality'' technologies like ''Second Life,'' computer technology may start to elide de Certeau's distinction between aerial and pedestrian perspectives, as users may choose their own proximity and elevation. We may speculate as to whether this will result in a new phase to supersede Heidegger's ''age of the world picture.'' On the one hand, these tools may be seen as modernity's ultimate total mapping tool, especially given their suspect institutional origin (relying as they do on the satellite technology of the current imperialist superpower). However, their public distribution has been greeted mostly with enthusiasm and wonder—perhaps that same sense of ''*excitement* when suddenly confronted with a *spectacular sight*'' that Bradford felt in his airplane in 1945 [Bradford 1956: 2].

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