

SHADOWS AND
ENLIGHTENMENT



MICHAEL BAXANDALL

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Shadows are holes in light. We see them all the time, and sometimes we notice them, but their part in our visual experience of the world is mysterious. In this book, an eminent art historian draws on contempo-

rary cognitive science, eighteenth-century theories of visual perception, and art history to discuss shadows and the visual knowledge they can offer.

‘[Baxandall] offers the kind of artwriting that convinces you that up to the moment you read it, you were blind to what matters in these paintings . . . Baxandall really deserves to be called Gombrich’s heir, for, like Gombrich, he combines far-ranging scrutiny of scientific psychology with miraculously close attention to detail.’ – David Carrier, *The Journal of Aesthetics and Art Criticism*

‘. . . a wonderfully immediate and precise analysis . . . a dazzling display of Baxandall’s thinking about his looking.’ – John Gage, *The Art Newspaper*

‘The text has fascinating things to say about what shadows may tell us of the shape and texture of objects, or of atmosphere and space.’ – *Choice*

‘One of the most important contributions of Michael Baxandall’s sharply focused and fascinating meditations on the nature and

qualities of shadows in *Shadows and Enlightenment* is to redirect our attention to the phenomenon of shadow in visual experience, in scientific and aesthetic theory, and in art . . . those that read this book with the attention that it demands will have a new vision of shadow in painting and, perhaps, in everyday life as well.’ – Dorothy Johnson, *Eighteenth-century Studies*

‘[Baxandall] suggests why painting easily holds attention and goes on giving pleasure when its subject-matter seems unimportant and its content minimal.’ – Peter Campbell, *London Review of Books*

‘Baxandall has opened up an area concerning shadows and shadow projection which has been completely ignored for so long. The information is handled with extreme delicacy and obvious thought.’ – Rowland MacKenzie, *Inferno: St. Andrews Journal of Art History*

Michael Baxandall is professor of the history of art at the University of California, Berkeley. He is also the author of *Giotto and the Orators, Painting and Experience in Fifteenth-Century Italy, Patterns of Intention, The Limewood Sculptors of Renaissance Germany*, and, with Svetlana Alpers, *Tiepolo and the Pictorial Intelligence*.

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AND ENLIGHTENMENT

Michael Baxandall

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Shadows and Enlightenment

Figura 111



1 Steps. Detail from Andrea Pozzo, *Prospettiva de' Pittori e Architetti, Parte Seconda* (Rome: J.J. Komarek, 1700), pl. 111.

PREFACE

This book is a discussion of shadows and their part in our visual experience. More particularly, it juxtaposes modern with eighteenth-century notions about shadows with a view to benefiting from a tension between them. Some other historical periods have also had interesting ideas about shadows, of course, but the book is not about these.

Chapter I is a short introduction on the physical constitution of shadows, and a preliminary differentiation of the physical types.

Chapter II sketches the eighteenth-century empiricist/nativist issue of the role of shadow in perception of shape. The story has already been well told by others, particularly Jean-Bernard Mérian [1770–80] and Michael J. Morgan (1977), but it is a base-line for the next three centuries' thought and must briefly be established here.

Chapter III looks at what seem to me the more interesting results of late twentieth-century research on shadow perception by cognitive scientists and machine vision workers. Its materials are rather discrete because shadow perception as such is not really an isolable functional domain in cognitive science.

Chapter IV deals in some detail with a previously neglected episode, the mid-eighteenth-century shadow observations of what I refer to (mainly for the convenience of a label) as Rococo Empiricism – some of the observers being artists, some scientists: these observations are quite different in their thrust from both the previously described bodies of thought, and I believe they are still interesting and valuable. The terms Rococo and Empiricism are used in the broadest sense.

Chapter V tries to set these three shadow universes in some relation to each other, partly by touching tangentially on the issue of visual attention to shadow through the special issue of

the status of shadows in painting. It is inconclusive, but the topic is shadow, and this chapter is not offered as art criticism.

An Appendix situates and summarises the shadow theory of Leonardo da Vinci, which had a strong though partly underground influence in the eighteenth century, as it still does.

The book was written out of an interest in looking at shadows and any reader will need the same, but it is coloured by being an offshoot of work-in-progress on problems of visual attention in eighteenth-century thought, in modern thought and in the art of painting. Attention is such a diffuse or tentacled concept that it touches most areas of visual perception, and shadow is certainly one of those areas: so much so that one may question whether attended and unattended shadows are the same thing; or (to put it another way) whether shadows survive attention.

A word about the Bibliography. Since the book involves itself with three distinct fields, the works cited are heterogeneous and must be highly selective. Books recommended for specific topics may be located by referring to the Notes by sections: sections may be located, if that is necessary, by referring to the Contents.

In the case of the cognitive science I obviously know that no items are included too technical for an art historian (say) to profit from. Most of the references are to handbooks, chosen partly for their good bibliographies, with further titles. For articles I have worked a great deal from such book-form collections as those of Horn and Brooks (1989) and Rock (1990). Not being a regular reader of the journals, I have gone to them only for specific items when pressed by special relevance, learned of through recommendation or citation in the other literature. This means two things: if a reference is to an article in a journal, as Lehky and Sejnowski (1988), it is essential; and secondly, given the nature of scientific publication, I am not up to date.

In the case of eighteenth-century books I have tried to use readily available modern editions, preferably in print, when adequate ones exist. These have references in which the date of original publication is given in square brackets – as Condillac [1754]: this means a modern edition is being used and cited. The original chapter and section numbers are then also often cited, for those using other editions. Modern facsimile reprints (cited as 'repr.') of books not available in modern editions are mentioned

when known; anyone working in such a field is much obliged to such reprint firms as Minkoff of Geneva and Olms of Hildesheim, to name only two.

In the case of the art history the referencing is deliberately minimal. In a field so choked with repetitious bibliographies, it seemed better to cite just the works with the specific material or ideas in hand – as Hills (1987) – and the works where the best general information and further bibliography is found – as, *Subleyras* (1987) – and leave it at that.

The draft of the book was written in summer and autumn 1991 in London, Sainte-Cécile-les-Vignes (Vaucluse), Vowchurch Common (Herefordshire) and Paris, localities and seasons named because in one way or another specific shadow landscapes from them enter the argument. During and for some time before this period I had the benefit of support from the John D. and Catherine T. MacArthur Foundation, to which I am much indebted; in particular, I should certainly not otherwise have had time for the dispersed kinds of reading involved in the book. The draft was revised in autumn 1992 at the start of a year at the Wissenschaftskolleg zu Berlin, to which I am also indebted, and I am particularly grateful to the librarians of this institution for their skill and determination in finding some previously elusive books. I am also grateful to James Griesemer and Eörs Szathmáry, colleagues in Berlin, for referring me to literature I had not known.

Before this, a graduate seminar on Rococo-Empiricist shadow theory, HA 262, in the spring of 1991 at the University of California, Berkeley, had turned out to have been a preparation for pulling a book together. I mention here those at Berkeley who responded most at that time: Svetlana Alpers, Harry Berger (at Santa Cruz), Evelyn Lincoln, Nina Lübbren, William MacGregor, Michael Podro, Patricia Reilly, Elizabeth Schott, Frances and Randolph Starn. And I am grateful to Tom Baxandall for the photograph reproduced as figure 9.

Finally, I owe a great deal to Gillian Malpass and John Nicoll of the Yale University Press in London for the good will, care and skill with which they took on and realized an awkward book.

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I

INTRODUCTION: HOLES IN A FLUX

1 Shadow originates in a local and relative deficiency of visible light.

Light is the flux of mass-energy units emitted by a source of radiation, the sun or a candle-flame. The mass-energy units, or photons, are surplus energy, the surplus product of smaller particles combining together to become larger particles, and some of these photons are more energetic than others. *Visible* light consists only of photons in the middle of that energy range, which is plotted in terms of the pulse of electrical disturbance, or wavelength. These moderately energetic photons are visible in that cells on the retina of the eye have evolved to react to them, as they do not to those of very low energy; those of very high energy are not admitted into the inner eye. If even a fairly full visible range is present, from blue-inducing photons at the high-energy or low-wavelength end of the visible gamut to red-inducing photons at the low-energy or high-wavelength end, we see white light.

The behaviour of any particular photon is notoriously unpredictable. Even to determine probabilities or make statistical predictions about the behaviour of multiples of photons involves the highly counter-intuitive calculations of quantum electrodynamics – no part of the present enterprise. When photons meet opaque surfaces, when they address transparent substances like glass and water, when they pass through holes, when they go past sharp edges, their behaviour is complex and strange because it is involved in intricate interchange with local electrons, not the simple bounce or trajectory of a commonsense-world projectile. And this strangeness does indeed bear on the forms of shadow. However, for initial purposes a fairly broad sense of the

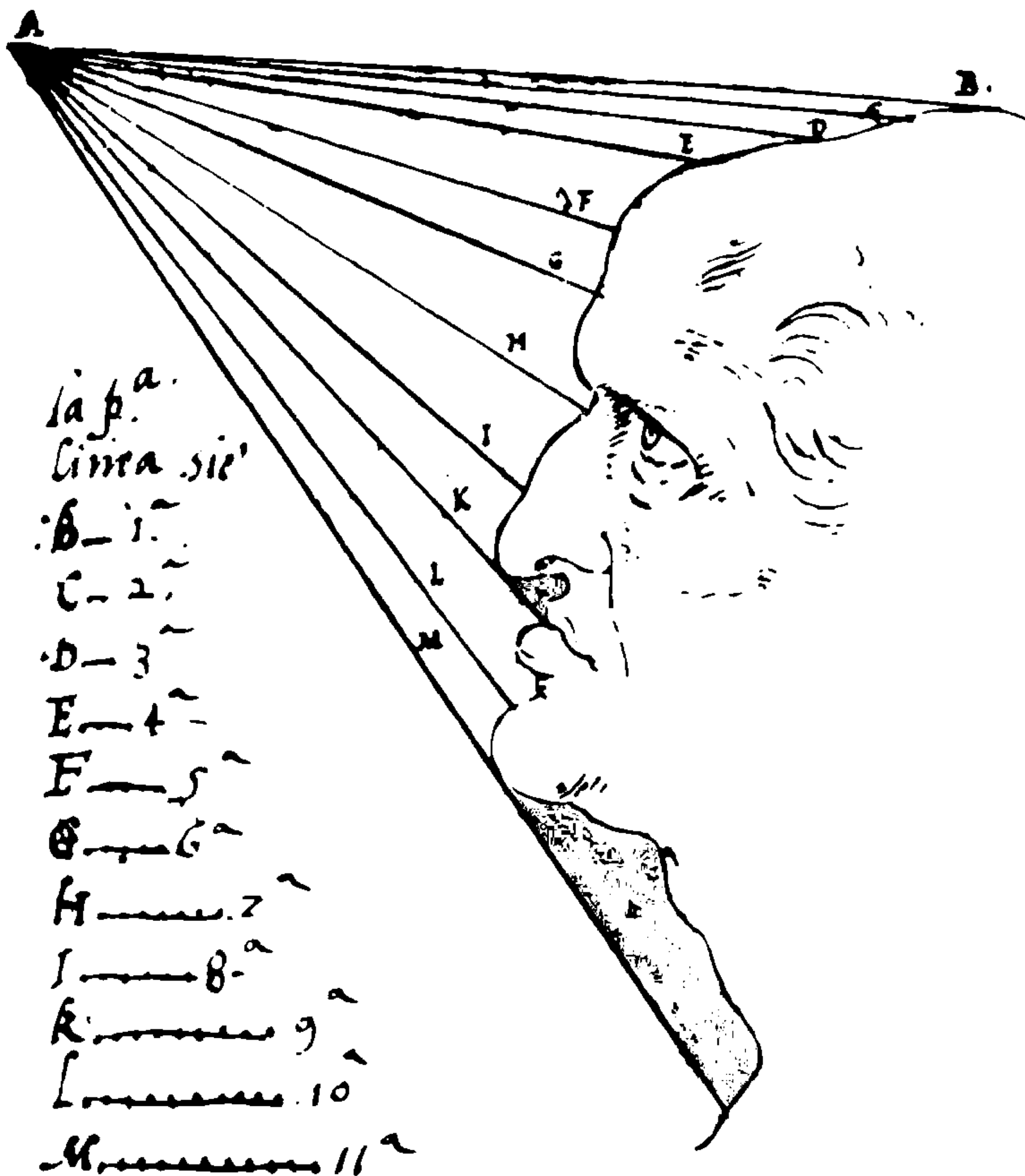
old principle of least action is adequate: **photons can be considered as tending to take the route most economical in time.** In consistent media such as clear air or water this route is often a fairly straight line; complications arise both within complex media like the atmosphere and at such interfaces between media as the bent-stick transition from air to water.

Some finer points of photon behaviour will, in fact, work themselves out as one proceeds into the morphology and behaviour of shadow – phenomena of reflection and diffraction, in particular – but for the moment two coarse points are the most important. First, photons often favour travel in straight lines. But, second, there are many molecular structures through which their energy is not transmitted as visible light. This means that in real mundane places with things standing about in them there are unevennesses, interruptions to the flux, almost ‘holes in the light’, as an eighteenth-century scientist called them. These are shadow.

2 Shadow, then, is in the first instance a local, relative deficiency in the quantity of light meeting a surface, and is objective. And in the second instance it is a local, relative variation in the quantity of light reflected from the surface to the eye. There are three distinct kinds of deficiency, and they emerge clearly in a sixteenth-century diagram drawn after Leonardo da Vinci (fig. 2) – who, as will presently appear, played a recurrent part in eighteenth-century thinking about shadow and vision.

A is the source of light radiating to the man’s face, with angles marked from B to M. The light source is, of course, abnormally close and schematically concentrated; and the face is conveniently heavy-featured. In two sectors, I–K on the lower nose and L–M on the chin, light meets obstructing solids. The tip of the nose prevents light from reaching the upper lip, and the chin prevents it from reaching the neck, even though the upper lip and neck are themselves angled to receive some light. These are one sort of shadow.

But the under part of the man’s nose and the underneath of his chin would also be without direct light from A, not because of obstruction by some other form but because they face away from the light. This is a second sort of shadow, even though it merges, in these cases, into the first.



2 After Leonardo da Vinci. Light falling on a face. Vatican Library, Rome, Codex Urbinas Latinus, fol. 219 recto.

A third sort of deficiency or shadow is only partial. A surface facing the source of light directly will, clearly, receive more intense light than a surface sharply angled in its relation to the light. It will receive more photons to the square millimetre. So the bridge of the man's nose at H-I will take more light than the receding part of his head at D-E. Even within H-I and D-E there are slight curves which will slightly modify incidence of light. The less light received, the less available to reflect, and so the less reflected.

One reason for labouring these distinctions is that there are slight but systematically confusing vaguenesses of differentiation in the current ordinary terms for shadow. The three sorts of

shadow just distinguished are usually called ~~cast shadow~~, *attached shadow* and *shading* respectively: these are normal terms. But the trouble with *cast* is that we tend to think of a cast shadow as something thrown from an object on to a separate surface, like our own shadow on the ground when we are in the sun. We are less likely to think of the shadow on the far side of a concave like the Leonardo man's neck as *cast*, partly because it is phenomenally almost continuous with the other sort of shadow under his chin. Indeed, we might think of the whole shadowed concave from chin to neck as *attached* shadow, for the good reason that it is on the object, not thrown (or detached) on to some other surface. So *attached* is not the ideal word for the second sort of shadow either. As for *shading*, the possibilities of confusion in this case seem to come from the association with the graphic act or fact of 'shading' in the sense of representational toning. We might take it to include representation of other sorts of shadow on the surface of an object, including the shadowing under the man's chin.

It would be destructive to coin a new set of terms to replace the vernacular words, and in any case much of what needs to be said will refer to shadow and shading in general. But sometimes it will be necessary to understand people making points specific to one sort of shadow, since some matters of shadow edge, shadow colour, shadow reflection, shadow value and so on are specific to shadow kinds. For this occasional purpose it will be best to qualify the vernacular terms. In the case of the first sort of shadow, that which is caused by a solid intervening between a surface and the light source (as by a nose preventing light from reaching an upper lip (fig. 2)) the term ~~projected shadow~~ will be used; and when a projected shadow is thrown on a differentiable surface, it may still surely be described as *cast*. In the case of the second sort of shadow, on surfaces which face away from the light (like the under part of the nose), the best term will be ~~self-shadow~~, which is the term used in computer vision studies. As ~~for shading~~, the word is much too generally current not to use, and if there is danger of ambiguity it can be qualified as ~~slant/tilt shading~~; slant being angle on the vertical axis and tilt being angle on the horizontal axis.

3 Occasionally it will also be necessary to distinguish in quite simple ways between different forms of light source, different