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**Berkeley's Theory of Vision:
Optical Origins and Ontological Consequences**

By Giovanni Battista Grandi

A Thesis

**Submitted to the Faculty of Graduate Studies and Research
through the Department of Philosophy
in Partial Fulfillment of the Requirements
for the Degree of Master of Arts
at the University of Windsor**

Windsor, Ontario, Canada

1997

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ABSTRACT

In the present work Berkeley's theory of vision is considered in its historical origins, in its relation to Berkeley's general philosophical conceptions, and in its early reception.

Berkeley's theory replaces an account of vision according to which distance and other spatial properties are deduced from elementary data through an unconscious geometric inference. This account of vision in terms of "natural geometry" was first introduced by Descartes and Malebranche. Among Berkeley's immediate sources of knowledge of the geometric theory of perception, a key role was played by the treatise of dioptrics of William Molyneux, Dioptrica Nova. Berkeley's understanding of "natural geometry" relies closely on Molyneux's description of the mechanism of vision which avoids the complexities of the accounts of Descartes and Malebranche.

In the first chapter Berkeley's theory is presented by way of contrast with Molyneux's theory. Berkeley thinks that we learn to see distance and other spatial properties by customary association between immediate visible objects and mediate tangible objects. A condition of the formation of the habit of association between the two sets of sensible objects is a regularity in their succession established by God. Hence vision is conceived as a language whereby God enables us to foresee what tangible objects will affect us upon perceiving certain visible objects.

In the second chapter I consider the relation between the

theory of vision and immaterialism. In the New Theory, Berkeley considered visible objects internal to the mind and tangible objects external to the mind. I argue that the theory of vision is compatible with either the internal or external existence of sensible objects. Berkeley can therefore translate the materialistic language concerning tangible objects into an immaterialistic language in his later works. I also highlight the fact that Berkeley seems to think that the internal existence of visible objects is a necessary requirement of his theory of vision. However, the main point of his theory of vision is the heterogeneity between sight and touch. Once it is demonstrated by independent argument that sensible objects are internal to the mind, the heterogeneity thesis shows that it is impossible to abstract a common idea of extension from them and so to postulate an external reality to which our different ideas refer.

In the final chapter I examine one of the first criticisms of Berkeley's theory, that which is found in William Porterfield's Treatise on the Eye. Porterfield explains the visual perception of situation and distance on the basis of an innate law according to which visible objects internal to the mind are judged to be at distance. This law is also adopted by Thomas Reid in his Inquiry into Human Mind. Porterfield and Reid adopt a key element of Berkeley's criticism of Cartesianism--that we do not deduce distance and other spatial properties geometrically from original visual data--and yet they attribute the connection not to experienced constant conjunction but to an innate link forged in

our minds from the time of our birth.

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ABBREVIATIONS

Berkeley:

- Alciphron Alciphron or the Minute Philosopher (1731)
Dialogues Three Dialogues between Hylas and Philonous (1710)

New Theory An Essay towards a New Theory of Vision (1709)
Principles A Treatise concerning the Principles of Human Knowledge, Part I (1710)

TVV The Theory of Vision Vindicated and Explained (1733)

Molyneux:

- Dioptrica Dioptrica Nova (1st edition 1692, 2d edition, 1710)

Porterfield:

- TE A Treatise on the Eye (1759)

Reid:

- Inquiry An Inquiry into the Human Mind (1764)

INTRODUCTION

Berkeley published the Essay towards a New Theory of Vision in 1709, one year before The Principles of Human Knowledge, which is considered by many as the first important presentation of an idealistic doctrine in the history of modern philosophy. We know from his notes taken between 1706 and 1708 that the two doctrines were conceived in the same period of time. The obvious problem that arises for the historian of philosophy is to know whether and in what manner the new theory of vision is connected with Berkeley's philosophy of immaterialism.

A different tradition of historical studies regards Berkeley's New Theory simply as an important document in the history of psychology, conceived as a purely empirical science in the modern sense. This tradition usually underestimates philosophical questions concerning the relation of the perceptual world to the underlying material reality. At the same time, many psychologists and scientists make use of philosophical categories, taking them for granted. I will try to explain this point.

A common classification distinguishes two general approaches to vision: empiricism and nativism, or, as others prefer to say,

associationism and intuitionism.¹ According to the empiricist theory, we "learn" to see by experience. This means that the elementary and original data that are available through the sense of vision do not provide us with all the spatial information we make use of. Hence, this additional information must be supplemented by the sense of touch. This is possible by a process of learning in which we develop a habit of associating visual data with tactual data which recur constantly together in our experience. The regularity of succession of visual and tactual data is obviously the condition for the development of this habit of association, what is called customary association. Berkeley is rightly considered as the beginner of this approach and the point of contention in the subsequent history of the development of the empiricist doctrine has been to determine exactly what these original visual data or experiences are, and to explain in particular the construction of the derivative visual world from these data through the process of association with touch. Now even the upholders of this doctrine usually presuppose a distinction between mind and body as different substances and the existence of an external world. Moreover, they tend to define and understand the original and elementary visual data--what Berkeley calls visible objects or ideas--in relation to certain events in our sense

¹ The terms "nativism" and "empiricism" are adopted by Nicholas Pastore, Selective History of Theories of Visual Perception: 1650-1950 (New York: Oxford University Press, 1971). The terms "intuitionism" and "associationism" (or "constructionism") are used by Lorne Falkenstein, "Intuition and Construction in Berkeley's Account of Visual Space," in Journal of the History of Philosophy, 22 (1994), 63-84.

organs. For example, an assumption that can be made is that through vision we have perception only of a two-dimensional coloured surface, which in some sense reminds us of the images we see on the retina of the eye of a dead animal. As a consequence, we cannot originally see distance or solidity but we come to know them only by associating this appearance of a surface with tangible objects. What I want to underline is that this understanding of the empiricist doctrine supposes the existence of external bodies which affect the sense-organs in a certain peculiar manner. For empiricists, the sense of vision can originally give us only an appearance of a two-dimensional coloured surface (or perhaps only of colours and light) and this is the reason why we must have recourse to experience to end up seeing what we usually say we see, in particular, distance. This approach would not entail the adoption of immaterialism and Berkeley's doctrine of vision could be seen quite independently of his philosophical speculation.

According to the opposite tradition of nativism, the sense of vision provides us originally with all the spatial information. So the problem is to understand the physical mechanism that causes our perception. This approach was begun by Descartes and in this case the assumption of the existence of an external world is obvious.

Now if we want really to understand the connection of Berkeley's theory of vision and immaterialism we must consider this doctrine in relation to the theories against which he argued. Philosophers like Descartes and Malebranche had definite positions on the nature of the mind and body and their interaction in visual

perception, and it is in relation to their positions that Berkeley's thought must be understood. But we must be aware of the fact that Berkeley has a particular interpretation of these doctrines. His description of Cartesian "natural geometry" does not reflect the complexity and difficulty that we find in the writings of Descartes and Malebranche.

The first objective of my research has been to find out a historical example of geometric theory of perception that perfectly fits the description of "natural geometry" given by Berkeley in the New Theory, avoiding the subtleties of the analysis of Descartes and Malebranche. The treatise of optics Dioptrica Nova (1692) of William Molyneux is among the books that Berkeley read on optics and we must remember that he frequently speaks generically of optic writers as supporters of "natural geometry." Consequently, I disagree with M. Atherton when she says in her recent book that this treatise concerns only the physics of vision and that a "geometric optics of this sort is not intended to have any psychological consequences."² It is quite clear that Berkeley considered treatises like this as related to a certain understanding of the psychology of vision, as I argue in my first chapter. But before considering Molyneux's work and Berkeley's reaction to it I want to consider the Berkeleian interpretation of "natural geometry" or the geometric theory of perception, and compare it with the positions actually held by Descartes and

² Margaret Atherton, Berkeley's Revolution in Vision (Ithaca and London: Cornell University Press, 1990), p. 17.

Malebranche.

According to Descartes, mind and body are two different substances whose essential attributes are thought and extension respectively. Although mind by definition is unextended, it has a "seat" in the body, that is, it is localized in a particular part of the brain, the pineal gland. Using a different language, the mind "interacts" with body in the pineal gland.³ Whether this account is incompatible with the immateriality of the mind, and so is a problem in Descartes' system, as Gassendi thought, is something that we will not consider.⁴ In passing, we will just mention that at this point in Descartes' explanation, expressions like internal and external, or within and without the mind, become ambiguous: they indicate both a location ("here" and "there") in relation to the "seat" of mind, and a dependence on or independence from the mind.

The actual interaction between body and mind involves a series of events. Some of them are on the physical level. Impulses from the external objects affect nervous filaments and are transmitted to the pineal gland where they cause movements of the animal spirits or movements of the gland itself. According to the laws of the union between mind and body, established by God or nature,

³ See Meditations on First Philosophy, Sixth Meditation, in The Philosophical Writings of Descartes, vol. 2, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch (Cambridge: Cambridge University Press, 1984), pp. 59-60.

⁴ For Gassendi's criticism and Descartes' reply see Meditations on First Philosophy, in The Philosophical Writings of Descartes, vol.2, Fifth Set of Objections, sec. 4-5, pp. 234-239, and Replies to Fifth Set of Objections, pp. 265-266.

these physical events cause ideas in the mind. Arguing against the doctrine of intentional species, of *idola* or resemblances transmitted from the objects to the organs, Descartes says that the image in the brain need not entirely resemble the outward objects.⁵ With regard to the ideas which are caused in the mind, Descartes distinguishes them in two kinds. The ideas of secondary qualities do not resemble the external causes. A colour does not have any resemblance with the motions and figures of external matter that cause it. Ideas of primary qualities resemble the external objects, even if they are often not perfectly identical to their exact configuration.⁶ This is, in general, the explanation given by Descartes. According to this account, for seeing distance it is sufficient that the actual distance causes a series of physical events in the sense organs and brain to which an idea of distance is connected. For example the turn of the eyes, when we see an object which is close causes a particular movement of the pineal gland from which an idea of distance arises, according to the law

⁵ See R. Descartes, Dioptrics, Discourse IV, in Philosophical Writings of Descartes, vol. 1, p. 165.

⁶ Descartes does not actually use the expressions "primary quality" or "secondary quality," but the distinction between extension which exists independent of us and sensible qualities (colours, smells, etc.) which do not resemble external qualities is central in his thought: see, for example, Meditations on First Philosophy, Replies to the Sixth Set of Objections, sec. 8, in The Philosophical Writings of Descartes, vol. 2, p. 297-298. Descartes says that "images" of primary qualities do not always resemble perfectly external qualities in Dioptrics, Discourse IV, in The Philosophical Writings of Descartes, pp. 165-166.

of the union of mind and body established by God.⁷

Malebranche draws some important conclusions from this account. His doctrine is highly complex. For example, it ascribes a different ontological status to ideas of secondary qualities, which are conceived simply as modifications of the soul, and to the ideas of primary qualities that are contemplated in God.⁸ Nevertheless, his point in relation to vision is that it implies a series of "natural judgments" performed by God. This notion of "natural judgment" is a sort of development of the laws of the union of mind and body of Descartes. What Malebranche seems to think is that the fact that our mind comes to perceive a visual world, and in general a perceptual world, involves a series of intellectual judgments. Since we are not aware of performing these judgments, God must perform them for us and present the results to us. For example, the fact that the actual distance ultimately causes an idea of distance, which is to a certain extent resemblant to the external cause, is possible only if from its "seat" the mind is able to reconstruct backwards the physical stimulus through a

⁷ On the deflection of the pineal gland and the flow of animal spirits as means to perceive distance, see R. Descartes, Treatise of Man, translated by Thomas Steele Hall (Cambridge, Massachusetts: Harvard University Press, 1972), pp. 94-96.

⁸ On the doctrine that we see ideas in God, and on their difference from soul's sensations, see N. Malebranche, The Search after Truth, bk. III, pt. II, chap. 6, translated by Thomas Lennon and Paul J. Olscamp (Columbus: Ohio State University Press, 1980), pp. 230-35. On colours as modifications of the soul, see *ibid.*, chap. 7, p. 238.

series of geometrical calculations.⁹ This idea was also mentioned briefly by Descartes, in his account of the binocular perception of distance. In this case, Descartes speaks of "natural geometry."¹⁰ What happens in the binocular perception of distance is that the axes of the two eyes turn toward a point in the object. From the knowledge of the interocular distance and the angles formed by the two axes with the line conjoining the two eyes it is possible to calculate the distance of the outward object. It is to be noticed that we are not aware of the premises of this judgment, that is, we do not know the angles and the interocular distance. Indeed, as Berkeley noticed, even the muscular feelings of the turning eyes are something dissimilar from angles. We are not even aware of performing this judgment. So it must be performed by God, as Malebranche claims, or in any case it must be unconscious (but how is it possible for Descartes to think of a mind which acts not consciously?). I think that an assumption of this theory is that our ideas resemble to a certain extent external qualities, that is, they are homogenous to the external world. The world we end up seeing (an idea) is geometrically deduced on the basis of unconscious knowledge of premises, events in our sense organs and

⁹ For Malebranche's doctrine on visual perception and natural judgment, see The Search after Truth, Bk. I, chap. IX, p. 40-47, and Elucidation XVI (Elucidation on Light and Colours), pp. 687-753. The evolution of Malebranche's thought is exposed in detail by Norman Smith, "Malebranche's Theory of the Perception of Distance and Magnitude," in British Journal of Psychology, 1 (1905), 191-204.

¹⁰ See R. Descartes, Dioptrics, Discourse VI, in The Philosophical Writings of Descartes, vol. 1, p. 170.

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brain, that are caused by the external objects that the ideas represent. This causation implies a homogeneity of essence, extension. This implies that, if not us, God must know and be able to perceive what happens in the body and from this information deduce some conclusion. The advantage of Molyneux's position for the understanding of Berkeley's interpretation of natural geometry is that it skips the whole account of brain physiology and just considers what occurs physically in the eyes. In this case the assumption is that the premises of the geometric reasoning are constituted by the images on the retina, and by the angles of the eyes and of the rays falling on the pupil.

While my aim in the first chapter is to present Berkeley's theory by way of contrast with a suitable historical example of geometric theory of perception, my objective in the second chapter is to show the precise relation between his theory of vision and his immaterialism. I first examine Berkeley's own assessment of the relation between the two doctrines as can be found in his statements referring to his New Theory in the Principles and in Dialogues.

In the New Theory, Berkeley considers the objects of sight as internal to the mind, and the objects of touch as external to the mind. In the Principles, Berkeley says that in the New Theory he has shown that visible objects are internal to the mind. Indeed, he seems to connect the fact that we do not immediately see distance and objects placed at distance with a demonstration of their internal existence. If objects appeared immediately to sight at

dis'

distance they would be external and independent of the mind. If objects do not appear immediately at distance, it is still possible to hold that they are internal and dependent on the mind.

The fact that we perceive objects at distance would show their independent existence only if we think that the mind has a location in absolute space that is different from the place in which objects are situated. Consequently, for an object to be "at distance" from the mind means at the same time to be independent of the mind. By the same token, to think that something is dependent on the mind, means that it is at no distance from the mind, that it is in the same place the mind is situated. Berkeley seems to think in this way in his interpretation of the New Theory in the Principles.

In the text of the New Theory the fact that distance and objects placed at distance are not immediately seen is more a premiss than a point that needs to be demonstrated. Although Berkeley seems to connect the fact that distance is not a proper object of sight with the internal existence of visible objects, the main argument of the New Theory concerns the heterogeneity of visible and tangible objects. So, a demonstration of their internal or external existence should be separated from any discussion concerning the nature of their relation, which is the subject of the New Theory.

I agree with M. Atherton and C. M. Turbayne that the works on vision and immaterialism draw on a common theory of signification

or representation.¹¹ In previous theories, visible qualities represented external qualities by way of resemblance and necessary connection. In Berkeley's theory, visible objects are altogether dissimilar in content from tangible objects. The conception of a complete heterogeneity between sight and touch occurred to Berkeley when thinking about the so-called "Molyneux problem," that is, whether a blind man who recovers sight would be able immediately to identify by the visible appearance of an object the shapes which he had previously learned by touch. If visible objects are altogether dissimilar from tangible objects, they can represent them only by way of customary association, like the words of a language. This is why vision is a language. Our learning to see through habit supposes a regularity in the succession of ideas of sight and touch that can only be guaranteed by God. This is why Berkeley calls vision a "natural language," "the language of God." The consequences of this theory for Berkeley's immaterialism are clear: if the ideas of sight and touch are heterogenous, we cannot abstract any common quality from them (extension) and consequently we avoid the postulation of an external reality to which the two sense-modalities refer. Whether Berkeley is really successful in establishing the absolute heterogeneity of sight and touch is doubtful and I have left this problem aside.

Moreover, if objects of one sense represent objects of another sense, scepticism concerning the reliability of our senses is

¹¹ See Atherton, Berkeley's Revolution in Vision, pp. 240-242, and C. M. Turbayne, "Editor's Commentary," in G. Berkeley, Works on Vision (Indianapolis: Bobbs-Merrill, 1963), pp. xli-xlv.

avoided. Indeed, if we conceive the objects of our senses as representative of objects utterly unperceivable by them, it is always possible to doubt of the reliability of our senses in representing the world. The arguments for heterogeneity are in themselves independent of any assumption of the internal or external existence of the visible and tangible objects. Still, they assume that visible objects are perceived immediately by sight and tangible objects are perceived immediately by touch. So the theory of vision could be adopted both in the metaphysical framework of phenomenalism and in the framework of direct realism. What this theory of representation would oppose is that what sensible objects represent are objects that are not perceivable by the senses at all. That the objects of the senses are dependent or independent of the mind is a further point of demonstration, and Berkeley thinks that if something is perceived, it can only exist in the mind.

Finally, according to these theories of heterogeneity and visual language, the meaning of "natural law" and of causation changes. In Berkeley's thought all the objects of experience succeed each other in a regular order only because of the will of God. In this sense M. Atherton speaks of the theory of vision as a "case history" of what is in general the relation between phenomena.¹² I argue, on the contrary, that vision maintains a privileged status in the works of Berkeley: visible ideas are considered signs and prognostics of our ideas of touch, to which

¹² See Atherton, Berkeley's Revolution in Vision, p. 218.

pleasure and pain are particularly attached.

In the second chapter I also discuss two seeming contradictions between the New Theory and the works on immaterialism. In the New Theory, Berkeley sometimes makes use of the language of optics and seems to suppose the existence of the objects of geometric optics (rays of light, images on the retina, etc.). I explain how this language can be reinterpreted in light of immaterialism, and in this way I also give a summary idea of Berkeley's conception of science.

The other problem I discuss in the second chapter is the conception of tangible objects as external in the New Theory. Is the independent existence of tangible objects a necessary requirement of the theory of vision? In this regard, I agree with M. Atherton in claiming that the asymmetry between sign and signifier in visual language does not require the assumption of the independent existence of tangible objects.¹³

If we allow that the asymmetry between sign and signifier in visual language does not depend on the independent existence of tangible qualities, I still do not understand how Berkeley can account for the position of "common sense" as it is outlined later in the century by Hume in the fourth part of the first book of the Treatise of Human Nature. It is true that Berkeley says that sensible qualities continue to exist in the mind of God once we stop perceiving them. But this belief arises only if we think

¹³ See *ibid.*, pp. 221-229.

philosophically on this subject. The experience of "common sense" in which we think that a sensible object has a continued and independent existence, at least apart from us if not absolutely speaking, seems to require a judgment in perception at work in any particular moment of our wakeful life. This judgment can only be due to God in our own immediate experience, and so it is another example of "natural law," a constant conjunction, established by God, between the sensible quality and the belief in its external existence (in relation to our mind). But this doctrine was never actually held, at least in this explicit form, by Berkeley.

This theme reappears later in my third and final chapter. The general aim of this chapter is to present one of the first criticisms of Berkeley's works on vision. In particular, I examine the Treatise on the Eye of W. Porterfield, and I also briefly refer to the Inquiry into the Human Mind of T. Reid.

In the Treatise on the Eye, Porterfield adopts a dualistic conception of mind-body relation and explains the visual perception of situation on the basis of an "innate law" which connects our "ideas" of direction with determinate lines to be drawn between the retina and the external object. I try to see the difference between this "innate law" and "natural geometry." "Natural geometry," as interpreted by Berkeley, consists in a sort of geometrical reconstruction of the external world from the data present in the eye. This reconstruction, or judgment, requires a homogeneity between the premises and the conclusion and a connection between them which is like that of a geometrical theorem. In case of the

"innate law," we have simply a constant conjunction established by God of our phenomenal space and of the real space.

In Porterfield's work, we also find a criticism of Berkeley's notion of experience. Porterfield seems to think that the construction by experience of a visual language, as depicted by Berkeley, would suppose a "natural law," that is, a determinate regularity in the succession of visible and tangible ideas. But in this regard, Berkeley would agree and this is why he speaks of vision as the language of God. But what Porterfield has in mind is most likely the experience of "externality" of the object of vision, in the sense of independence from our mind. Even admitting that it is touch that furnishes us with the idea of "externality" in the sense of independence from the mind (which Porterfield, in Cartesian terms, identifies *tout court* with externality as location in relation to the body and the seat of mind), this can be possible only if there is law, a constant conjunction established by God, of tangible ideas with the conception of their independent existence. But Berkeley, in any case, denies that tangible objects imply the idea of their absolute external existence.

Reid accepts the same law of visual perception of situation as Porterfield, with only a slight modification. What is interesting is the adoption by Reid of the Berkeleian metaphor of language in order to explain the relation between sensation and the conception and belief of an external world in perception. The sensation and the belief have no similitude between them and this justifies the adoption of the metaphor of language. Still, the association

between sensation and belief is not habitual, that is, is not learned through experience, but is operative from the time of our birth.¹⁴

In short, my main aim in this work is to conceive Berkeley's theory as an example of a new theory of representation which supposes a new conception of the connection between the phenomena of vision and touch simply as constant conjunction. Berkeley's immaterialism is a natural extension of this conception. At the same time one can see how early critics of Berkeley such as Porterfield and Reid adopt a key element of his criticism of Cartesianism--that we do not deduce distance geometrically from visual data--and yet attribute the connection not to experience but to an innate link forged in our minds from the time of our birth. In so doing they reject the key conclusion resulting from Berkeley's complete reliance on experienced constant conjunction, namely, his immaterialism.

¹⁴ I added four appendices in which I detail some further aspect of the theories of Porterfield and Reid.

CHAPTER I

Molyneux and Berkeley: Natural Geometry and New Theory of Vision

1. Introduction

It is well known that Berkeley read many works concerning optics that can be considered as the sources of his Essay towards a New Theory of Vision (1709). Certainly he was well acquainted with the Lectiones Opticae (1669) of Isaac Barrow, with the recently published Opticks (1704) of Newton, and, of course, with the works of Descartes and Malebranche on the subject. Among these different sources, a major role was played by the works of his fellow citizen William Molyneux of Dublin (1656-1698).

The most important contributions of Molyneux were in the development of dioptrics, especially in the solution of many technical problems concerning the way of calculating the focal length of optic lenses variously combined or problems related to the manufacture of telescopes. In this particular field he was helped by the correspondence and exchange of ideas he had with the most important authors on optics of the period such as Flamsteed and Halley. His interests were not only confined to geometric optics and its technological applications: he also actively contributed to the diffusion of the new Cartesian philosophy with a translation of Descartes's Meditations.

Molyneux was also in correspondence with Locke. Although they met personally only once, they were in friendly terms and they shared the same philosophical views as it is evident from the praise contained in the preface of Molyneux's major work Dioptrica Nova (1692):

...To none do we owe for a greater advancement in this part of philosophy, than to the incomparable Mr. Locke, who, in his Essay concerning Humane Understanding, has rectified more received mistakes, and delivered more profound truths, established on experience and observation, for the direction of man's mind in the prosecution of knowledge, (which I think may be properly termed Logick) than are to be met with in all the volumes of the antients. He has clearly overthrown all those metaphysical whysies, which infected men's brains with a spice of madness, whereby they feigned a knowledge where they had none, by making a noise with sounds, without clear and distinct significations (Dioptrica, pref., p. 4).

The correspondence between the two authors is famous for the problem proposed by Molyneux to Locke in a letter of 1693, later introduced in the section 8, Chapter 9, Book 2 of the Essay concerning Human Understanding. We know that Berkeley considered the correct understanding of the Molyneux problem as the key for solving the problems of visual perception in a completely new way, with revolutionary implications for a general theory of knowledge.

Thanks to Molyneux, Locke's Essay was introduced to Trinity College before it was taught at Oxford and Cambridge.¹ Moreover, at Trinity College, Berkeley met the son of William Molyneux, Samuel, who was also, like the father, interested in optics and in the works of Descartes, Locke and Newton. These facts well account for

¹ See C. M. Turbayne, "Berkeley and Molyneux on Retinal Images," Journal of the History of Ideas, 16 (1955) p. 341.

the knowledge Berkeley had of different works of Molyneux while writing his notebooks and An Essay towards a New Theory of Vision.

We must consider three sources of Berkeley's knowledge of Molyneux:

1) The articles in the Philosophical Transactions on various problems in optics;

2) The Molyneux problem as it is reported in the Essay concerning Human Understanding;

3) The treatise of dioptrics Dioptrica Nova (1692).

Among the several articles that Molyneux wrote in the Philosophical Transactions, particularly one concerning the problem of the appearance of the moon on the horizon is important. It is a survey made by Molyneux of the different solutions proposed to the problem that the moon on the horizon appears bigger than when high in the sky. Molyneux considers the different solutions given by Descartes, Gassendi, Hobbes and shows how they are all unsatisfactory. This problem is dealt with by Berkeley at the end of the part of the New Theory concerning the perception of size. His particular explanation of the perception of size is applied to the solution of this problem. The same procedure is applied to the solution of the other two problems of perception considered by Berkeley, that is, perception of distance and situation: 1) the problem of visual perception of distance, size, or situation is solved; 2) there is an application of these solutions to particular problematic cases (Barrow's case for distance, the horizontal moon for size, inverted retinal images for situation); 3) there is a

discussion of the Molyneux problem concerning each of the three general problems of visual perception (distance, size, and situation).

While the case of the moon on the horizon is considered specifically in this article, the other two problems concerning distance and situation are objects of discussion in the major work of Molyneux, Dioptrica Nova. Indeed, I think that this treatise must be seen not only as a book of optics but as an example of that geometric theory of perception Berkeley argued against in his New Theory.

I will try to consider in detail the position concerning visual perception held by Molyneux in this treatise and to show not only the differences from Berkeley's position, but the less evident and less important differences with the other two authors Berkeley is arguing against, Malebranche and Descartes.

2. *The Preface to the Dioptrica Nova*

The preface to the Dioptrica Nova, which is dedicated to the Royal Society, begins with a sharp attack to the old "verbose" philosophy of the commentaries to Aristotle's physics to which the new method of the "experimental philosophy" is opposed: "In this last age the generous undertakings of the philosophic societies of Europe have dissipated these dark mists, and have abdicated this kind of stuff" (Dioptrica, pref., p. 2). Locke, as we have seen, is

considered by Molyneux as the major contributor in establishing the logic of the new method of research so that

natural philosophy is now prosecuted by observation, experiment, and history thereof. And indeed if we consider rightly, there is really no other sort of natural philosophy, but this only. For by natural philosophy do we mean anything else, but the knowledge of the properties and affections of natural bodies? And is this to be obtained otherwise, than by experiment and observation? (*Dioptrica*, pref., p. 5)

As Molyneux remarks,

some will say, that by natural philosophy is meant not only the knowledge of the properties and uses of natural bodies; but also the assigning the true reasons or causes of these properties. But in this particular we are to proceed with great caution (*Dioptrica*, pref., p. 5).

He thinks that it is possible "to make plausible conjectures and some sort of reasonable guesses" about the nature of the real causes of the phenomena, "but indeed in natural disquisitions 'tis generally to no purpose [...] they serve only for chat and diversion" (*Dioptrica*, pref., pp. 5-6). We cannot know the real and adequate causes of nature's operations because God has ordered them to be performed by "fine springs, secret motions, and inexplicable ways." Men must content themselves with "the contemplation of the plain matter of fact" (*Dioptrica*, pref., p. 5). Through often repeated and carefully examined experiments and observations we may find the immediate cause of a phenomenon. But we must not consider it as the real, undoubted and adequate cause of it. These experiments and observations we make use of for establishing our hypothesis, however, must be considered "unquestionable truths and shall be embraced as many steps of advancement in the knowledge of nature" (*Dioptrica*, pref., p. 6).

The reference to the "fine springs and secret motions" may seem to show that for Molyneux the reason of our ignorance of the real causes of natural phenomena is to be ascribed only to the limits of our senses which are incapable of detecting the motions of the invisible particles of matter. This appears from what he adds to his discussion of the Torricellian example:

'Tis true that by this experiment we have most probably arrived at the knowledge of one link more in the chain of natural causes; but this is not conclusive; this puts not an end to the enquiry (*Dioptrica*, pref., p. 7).

When we say that what puts a pendulum clock in motion is the wheel that beats on the pallets we have only find one link and not what moves the whole chain. We can explain the movement of the wheel referring to weight or to the spring, but we do not know the cause of the motion of the weight and spring: "what moves them is absolutely unknown" (*Dioptrica*, pref. p. 7). The cause of elasticity and gravity of bodies is incomprehensible.

He illustrates this epistemological position with an example: in the Torricellian example the cause of the equipoise of the liquors is considered the gravitation of the air. But, through this explanation, we obtain little more truth than the plain matter of fact of the experiment:

But what is the cause of this equipoise of liquors, or the cause of the gravitation of any liquors, or any bodies? that is, what is the cause of gravity in general is clearly unknown to us; and consequently the ultimate cause of the mercury's suspension is not hereby discovered (*Dioptrica*, pref., pp. 6-7).

This scepticism about the possibility of knowing the real cause of gravity reflects the position of Newton and of the other members of the Royal Society at that time.

That we cannot discover the real microscopic causes of motion, because of the limits of our senses, is a point of view that was also held by Locke in his two drafts of the Essay concerning Human Understanding. But it is not clear if he also had in mind the more radical view of the chapter about power of the Essay, that the communication of motion from one body to another by impulse is inexplicable. Locke indeed says that we derive only "a very obscure idea" of active power from the observation of communication of motion between physical objects.

A body at rest affords us no idea of any active power to move; and when it is set in motion itself, that motion is rather a passion than an action in it. For when the ball obeys the motion of a billiard-stick, it is not any action of the ball, but bare passion. Also when by impulse it sets another ball in motion that lays in its way, it only communicates the motion it had received from another and loses in itself so much as the other received: which gives us but a very obscure idea of an active power of moving in body, whilst we observe it only to transfer, but not to produce any motion. For it is but a very obscure idea of power which reaches not the production of the action, but the continuation of the passion.²

That Molyneux considered the motion in itself inexplicable seems to appear from what he says regarding the cause of fire:

If we ask how fire burns? 'tis answered, by exciting a violent motion in the parts of the combustible matter; which indeed is not more than the same thing in different

² John Locke, Essay concerning Human Understanding, 2.21.4, ed. P. H. Nidditch (Oxford: Clarendon Press, 1975), p. 235.

words. But how motion is excited by one body to another is absolutely inexplicable (Dioptrica, pref., p. 7).

His conclusion seems to be about motion in general and not only about the motion which is the cause of the fire.

The aim of all Molyneux's discussion, however, is simply to explain the nature of the method he will make use of in the first part of his treatise. Talking about refraction of light, he will avoid speculations about the intimate cause of it and the nature of light:

Since therefore we cannot expect to arrive at the intimate knowledge of Nature's operations, let us apply only ourselves to know as much of her, as we may be certain of. And this only in matters of experiment and tryal; wherein by the infallible guidance of our senses we cannot be deceived (Dioptrica, pref., p. 9).

Only in the second part of the treatise will Molyneux devote a chapter to the nature of light, defending the Newtonian corpuscular hypothesis.

3. *The Mechanism of Vision*

The first part of the Dioptrica Nova consists of fifty-nine propositions set out in Euclidean style, as J.G. Simms describes them.³ Molyneux begins by defining the terms which he will use, because changes and incoherence in the use of words had caused confusion in the works on the subject. He then sets out the law of refraction. He makes use of the proportions found between the sines

³ J. G. Simms, William Molyneux of Dublin, ed. P. H. Kelly (Dublin: Irish Academic Press, 1982), p. 66.

of the angles of incidence and of refraction from air to glass and vice versa measured by Newton (he refers to one of the Optical Papers on colours and light), but he also refers to the less accurate measurements made by Descartes.⁴ This is an occasion for a short history of the discovery of the law of refraction: while Kepler believed that the proportion to be found was that between the angle of incidence and the angle of refraction, Descartes was the first to understand that the real proportion was between the sines of the angles.

In the following one hundred pages, Molyneux shows the geometrical methods for finding the focus of the different types of lenses (convex, concaves, first considered alone and then variously combined together). This elaborate account is necessary for introducing his descriptions of the telescopes and of the microscopes. In order to show the use and manufacture of these instruments, Molyneux must explain how different combinations of lenses make an object appear distinct or confused, nearer or farther, bigger or smaller, at the same distance or the same size as the object seen with the naked eye. Finally he shows whether it is seen erect or inverse through these lenses.

Molyneux finds necessary to devote the twenty-eighth proposition, preliminary to his discussion of telescopes, to the

⁴ Molyneux refers to Descartes' Dioptrics, Discourse II, sec. 7 (see Philosophical Writings of Descartes, vol. 1, p. 161) where Descartes presents the law of refraction, now known as Snell's law. However, in that part of the Dioptrics, there is just a general formulation of the law and no mention of the particular constant relative to the refraction from air to glass and vice versa.

nature of sight: "the manner of plain vision with naked eye is expounded." It is here that we can find a first exposition of the geometric theory of perception opposed by Berkeley. Particularly, at the end of this proposition there is a discussion of the problem of the inverted retinal image. The perception of distance is explained in another proposition (prop. XXXI) along with the discussion of the famous Barrow case. Since Molyneux, as other optic writers, believes that a real judgement of size must take account of distance, this proposition enlightens and completes Molyneux's view of this question.

At the beginning of the twenty-eighth proposition, Molyneux describes the anatomy of the eye. According to an established tradition, he compares the eye to a *camera obscura*. He then gives a short account of the mechanism of vision:

By the foremention'd scheme we perceive the rays from each point of the object are all confused together on the pupil in *gh*, so that the eye is placed in the place of the greatest confusion: but by means of the humours and coats thereof each cone of rays is separated, and brought by it self to determine in its proper point on the retina, there painting distinctly the vivid representation of the object; which representation is there perceived by the sensitive soul (whatever it be) the manner of whose actions and passions are past finding out (*Dioptrica*, prop. XXVIII, p. 104, see p. 140 facsimile of tab. 25, fig. 1, p. 103).

This passage shows that he shares an opinion of other optic writers of the period that the immediate object of the soul in vision is the picture on the retina. However, this account is less sophisticated than the one given by the philosophers, especially by Descartes and Malebranche, for two reasons: 1) Malebranche and Descartes try to give a more complete account of the physiology of

vision. They consider not only the eye, but also the nerves, the brain, the pineal gland, etc.⁵ 2) Since they try to describe the visual stimulus right up to its imprint on the pineal gland, they cannot consider the immediate object of vision the picture on the retina.⁶

It is generally agreed that for Malebranche the immediate object of vision is an idea and a "sentiment." The idea is perceived in God and represents things outside as they are, extended. The "sentiment," i. e. the colour, is only dependent on what happens on the body; it is not similar either to the picture on the retina or to its external cause.⁷

According to the most common interpretation of Descartes, the proper immediate objects of vision are ideas, colours or extension, which, on the basis of the laws of mind-body relation, are dependent on what happens in the body. Only extension resembles external objects.⁸

However, the view shared by geometric writers and philosophers is that in vision we are not immediately aware of the objects without. The immediate object, even if it is not the picture on the

⁵ For Descartes's account of the physiology of vision, see Treatise of Man, pp. 49-68, and pp. 77-115. See also Dioptrics, Discourse IV, V, VI, in the Philosophical Writings of Descartes, pp. 164-175. For Malebranche's account of the physiology of vision, see The Search after Truth, Elucidation XVI, pp. 687-753.

⁶ See Descartes, Dioptrics, Discourse IV and Discourse V, in The Philosophical Writings of Descartes, vol. 1, p. 165 e p. 167.

⁷ See Introduction, above, p. 7, n. 8, for reference.

⁸ See *ibid.*, p. 6, n. 6, for reference.

retina is, at least, dependent on what happens on the retina, and consequently in the brain. The objects we normally see are the results of an inference from the first immediate objects. This inference from the immediate object has the characteristics of a geometric inference; that is, there is a necessary connection between the premises and the conclusions. This necessary connection is possible because certain features (extension) of the immediate object and of the mediate object are homogeneous, but also because what is immediately available to the visual system, though in an unconscious way, is not only what, strictly speaking, happens on the retina or is dependant on what happens on the retina, but some other information about the eye and the path followed by the rays in the eye. This distinction between these two characters of the inference is of great importance. If we consider only the second character, the theory of Berkeley seems only a more reasonable explanation of vision that takes seriously the claim that what we are immediately aware of is what happens on the retina or at least is dependent on the retina. This is particularly clear in the discussion of distance in the New Theory. But if we consider also the issue of the heterogeneity of sight and touch, recognized through his reflection on the "Molyneux problem," the view of Berkeley is really incompatible with the position held by the geometric writers and by the other philosophers.

4. The Perception of Distance

After his short introduction about the immediate object of vision, Molyneux goes on in proposition XXVIII with an explication of the problem of the inverted retinal image. However, following the order of discussion of Berkeley's New Theory, I will first focus my discussion on proposition XXXI where we can find an example of the geometric theory of perception regarding distance.

The discussion of the perception of distance is obviously necessary, as we have seen, for introducing the theme of the apparent place (*locus apparens*) of the objects seen through lenses. Molyneux first distinguishes the estimate of distance we make of far objects from the one we make of near objects:

In plain vision the estimate we make of the distance of objects (especially when so far removed that the interval between our two eyes bears no sensible proportion thereto; or when look'd upon with one eye only) is rather the act of our judgement than of our sense; and acquired by exercise and a faculty of comparing, rather than natural. For distance of itself, is not to be perceived; for it is a line (or a length) presented to our eye with its end towards us (Dioptrica, prop. XXXI, p. 113).

In this passage, Molyneux recognizes that the estimate of distance of far objects is due to an "act of judgment." Moreover, the ability to estimate the distance of far objects is "acquired" by "exercise" and a "faculty of comparing." Although he does not exactly explain what he means by these expressions, it is clear that he thinks that experience and judgment play a role in our visual perception, although this is limited in the Dioptrica Nova to the perception of far objects. Molyneux certainly knew the position of Locke on the role of judgment and habit in perception.

In chapter IX, Book II, of the Essay, Locke said that "the ideas we receive by sensation are often in grown people altered by the judgment, without our taking notice of it."⁹ In the same chapter, Locke says that the immediate object of the sense of sight is not three-dimensional but two-dimensional, and that having been accustomed to know what appearances objects make to the sense of sight, "the judgment presently, by an habitual custom, alters the appearances into their causes."¹⁰ Molyneux shared these ideas, and, indeed, he conceived the "jocose" problem, inserted in the second edition of Locke's Essay, that has become famous as the "Molyneux problem."

... I shall here insert a problem of that very ingenious and studious promoter of real knowledge, the learned and worthy Mr. Molyneux, which he was pleased to send me in a letter some months since; and it is this: "Suppose a man born blind, and now adult, and taught by his touch to distinguish between a cube and a sphere of the same metal, and nighly of the same bigness, so as to tell, when he felt one and the other, which is the cube, which the sphere. Suppose then the cube and the sphere placed on a table, and the blind man be made to see: quaere, whether by his sight, before he touched them, he could now distinguish and tell which is the globe, which the cube?" To which the acute and judicious proposer answers, "Not. For though he has obtained the experience of how a globe, how a cube affects his touch, yet he has not yet obtained the experience, that what affects his touch so or so, must affect his sight so or so: or that a protuberant angle in the cube, that pressed his hand unequally, shall appear to his eye as it does in the cube." I agree with this thinking gentleman whom I am proud to call my friend, in his answer to this problem.¹¹

⁹ J. Locke, Essay, 2.9.8., p. 145.

¹⁰ Ibid.

¹¹ Ibid.

The "Molyneux problem" is at the basis of Berkeley's thesis on the heterogeneity of sight and touch, and of his conception of visual perception as customary association of visible and tangible objects. In the Dioptrica Nova, Molyneux refers to the role of experience and habitual judgment very briefly and only in regard to the visual perception of far objects. But it is important to stress this aspect of his thought, because in the rest of his discussion on vision he adopts a different view.

That Berkeley read these parts of the Dioptrica Nova is quite evident. Molyneux says that "distance of itself is not to be perceived; for it is a line (or length) presented to our eye with its end towards us" (Dioptrica, prop. XXXI, p. 113). This sentence is almost repeated verbatim at the beginning of section 2 of Berkeley's New Theory. In this passage, Berkeley seems to share with Molyneux and with the other authors the assumption that what we immediately are aware of depends on the picture on the retina. We do not immediately see distance because it is a line which projects only a point on the retina.

Molyneux shows the purely psychological means, apprehended through exercise, for learning distance of far objects:

Distance is chiefly perceived by means of interjacent bodies, as by the earth, mountains, hills, fields, trees, houses, etc. Or by the estimate we make of the comparative magnitude of bodies, or of their faint colours, etc. These I say are the chief means of apprehending the distance of the objects, that are considerably remote (Dioptrica, prop. XXXI, p. 113).

These three means for apprehending distance (interjacent objects, comparative magnitude of objects when they are near and

distant, faintness of their appearance) are reported also by Berkeley (New Theory, sec. 3). These means are learned through experience, as Berkeley states, clearly referring to Molyneux's distinction at the beginning of his proposition between act of judgement and act of sense: "I found also acknowledged that the estimate we make of the distance of objects considerably remote is rather an act of judgement grounded on experience than of sense (New Theory, sec. 3).

As I said, Molyneux does not devote much time to the analysis of this act of judgment. It is a judgment become customary through a long experience and so we are now not always aware of it, while we perceive. This is the reason why people, according to common sense, believe that distance is perceived by itself. But if we pay attention we can be aware of these judgments again. Moreover, as Berkeley remarks (New Theory, sec. 5), these acts of judgments are grounded on experience, on a customary association of ideas, because between the premises and the conclusions there is no necessary connection: between faintness and distance there is no necessary connection. This is why these judgments can be deceptive.

We have different and more precise means for learning the distance of near objects. These judgments are what properly is called by Descartes and Malebranche natural geometry.¹² The

¹² See R. Descartes, Dioptrics, Discourse VI, in The Philosophical Writings of Descartes, p. 170. Malebranche uses both the expressions "natural geometry" and "natural judgment." For Malebranche's use of the expression "natural geometry," see The Search after Truth, Bk. I, chap. IX, pp. 41-42, and Elucidation XVI, pp. 733-734, pp. 746-747.

expressions "natural judgment" or "natural geometry" are not used by Molyneux, but the two means for learning distance of near objects are similar to those adopted by the two philosophers, the inclination of the rays on the pupil and the angle formed by optic axes:

As to nigh objects, to whose distance the interval of the eyes bears a sensible proportion, their distance is perceived by the turn of the eyes, or by the angle of the optick axes (Dioptrica, prop. XXXI, p. 113).

Therefore when we estimate distance of nigh objects either we take the help of both eyes, or else we consider the pupil of one eye as having breadth, and receiving a parcel of rays from each radiating point. And according to the various inclination of the rays from one point, on the various parts of the pupil we make our estimate of the distance of the object (Dioptrica, prop. XXXI, p. 114).

In this case the judgment, as Berkeley remarks, is not grounded on experience. From the knowledge we have of the breadth of the pupil and of the angles formed by two rays falling on its border we can calculate the distance of the object. The more the rays approach to a parallelism, the farther off is the point of their intersection. Here the premises (the angles, the breadth of the pupil) are connected with the conclusions (distance) in a necessary way. We judge of distance in the same way as we reach "a conclusion in mathematics, betwixt which and the premises there is a necessary connection" (New Theory, sec. 24). But as Berkeley remarks, people can well judge distance, but they do so without any mathematical inference. His ground for rejecting the claim that there is any deductive judgment is that we can easily explain the judgment of distance on the basis of the experience of constant

association between certain ideas of sight (or which accompany sight) with certain ideas of touch. Moreover, Berkeley remarks that we are not aware of the premises of this deductive judgment.

I appeal to any one's experience whether upon sight of an object he computes its distance by the bigness of the angle made by the meeting of the two optic axes? Or whether he ever thinks of the greater or lesser divergency of the rays, which arrive from any point to his pupil? Everyone is himself the best judge of what he perceives, and what not. In vain shall any man tell me that I perceive certain lines and angles which introduce into my mind the various ideas of distance, so long as I myself am conscious of no such thing (New Theory, sec. 12).

It seems that, according to Molyneux, what we are immediately aware of is what happens on the retina, or at least resembles what happens on the retina. Distance is not available on the retina and must be inferred in some way. Now, according to Molyneux distance is deduced or calculated on the basis of our knowledge of angles and lines. Information necessary for this judgment, lines and angles, cannot be present on the retina, and consequently to our consciousness. So, it seems that these data must be available in some way of which we are not conscious and consequently that the calculation of distance can be made only in a totally unconscious way, by a kind of natural geometry. It is true, as Turbayne remarks that Molyneux speaks of the turn of the eyes and not only of the optic angle, in binocular vision.¹³ Similarly, we find references to muscular sensations of the eyes in Malebranche.¹⁴ These

¹³ See Turbayne, "Berkeley and Molyneux on Retinal Images," p. 341.

¹⁴ See Malebranche, The Search after Truth, Bk. I, chap. IX, sec. 1, p. 45.

references are evidences of a confusion in the two authors between a psychological and a geometrical explanation of perception of near objects.

Berkeley believes that, distance, not being an idea immediately available, can be suggested by other ideas we are aware of. Those ideas (muscular sensation for binocular vision, confusion and straining of the eye for monocular vision) are connected with our awareness of distance only through experience.

The definition of what we are immediately aware of in vision is not totally clear in Berkeley. On the one hand the ground for this definition seems to be only immediate data of consciousness, in a strict empiricist view: in this sense in vision we are only aware of colours. On the other hand, he seems to share the premises of the optic writers and defines the field of consciousness in relation to what happens on the retina. As M. Atherton remarks, solving the problems of how we see distance, Berkeley seems to assume the external existence of bodies, reflecting rays of light.¹⁵ His claim that distance is not an immediate object of vision is shared by the optic writers. The difference is that he takes seriously the claim that what we are aware of is only what happens on the retina. Not being available on the retina distance must be available to consciousness in some other way. We are not aware of angles and lines and so we see distance associating some visual cues (or cues, like the muscular sensations, which accompany

¹⁵ Atherton, Berkeley's Revolution in Vision, p. 88.

vision) to distance as it is immediately available to another sense, namely the sense of touch.

5. *The Barrovian Case*

According to Molyneux, the two means for judging the distance of a near object are the angles formed by the optic axes and the angles formed by the divergent rays falling on the pupil. Since in telescopes and microscopes vision is monocular, Molyneux is particularly interested in showing the effects of the refraction of lenses concerning the apparent place of objects that affect this second manner of judging distance:

If therefore by refraction through glasses, that parcel of rays which falls on the pupil from each point in nigh objects be made to flow as close together as those from distant objects; or the rays from distant object be made to diverge, as much as if they flow'd from nigh objects, the eye through such glasses shall perceive the place of the object changed (*Dioptrica*, prop. XXXI, p. 114).

The eye is not sensible of the outward accidental refraction of the ray in its passage through the lens, but only of the ray that falls immediately on it and this accounts for this change in the location of the object. He explains this phenomenon with the example of seeing a coin in the bottom of a vessel. He then shows how the different types of lenses can change the apparent place of an object. An object seen through a plain lens appears nearer. If it is seen through a convex lens, the apparent place changes in relation to two factors: the distance of the object from the lens and the distance of the eye from the lens. The object can be nearer

to or farther from the lens than its focus, or in the same position of it. If the radiating point is nearer to the lens than its focus, the rays falling on the lens are divergent. After passing through the lens they are still divergent but not so much as before. The angles formed by the rays with the pupil being greater, the object appears farther. If the object is in the focus of the lens, the rays after refraction fall on the pupil parallel: "In this case there is no rule whereby to determine the locus of the object. And Barrow tells only, quod remotissime positum aestimatur. lect. 18 ad finem" (*Dioptrica*, prop. XXXI, p. 117).

According to this way of explaining the apparent place of an object, the less the rays falling on the pupil are divergent, the farther the object appears. Then it would seem natural to argue that if the rays falling on the pupil are convergent the object should appear very far, even farther than when the rays are parallel. But this is contradicted by the experience, as Barrow found:

In this and the last section lies the great difficulty, which the incomparable and most profoundly learned Barrow (Lect. Opt. 18, sect. 13) confessedly passes over as insuperable and not to be explained by whatever theories we have yet of vision. For seeing that the object which applies to the eye by less diverging rays, is judged the more remote; and that which applies to the eye by parallel rays, is reputed the most remote; it should seem reasonably to follow, that what is seen by converging rays, should appear yet most remote of all: and yet experience contradicts this, and testifies, that the point a, tab. 27, fig. 4 [see p. 141 facsimile], appears variously distant, according to the various situations of the eye between the glass and distinct base; and that it does almost never (if ever) appear more distant than the point a itself to the naked sight, and sometimes it appears much nigher (*Dioptrica*, prop. XXXI, p. 118).

As Molyneux reports, when the eye is near the lens, the object appears in its natural place and when the eye recedes from the lens towards the distinct base (which is the point where the different rays flowing from a radiating point meet after refraction) the object seems to approach "till at last, the eye being placed at a certain station, as the distinct base, the point a appears very nigh, so that it begins to vanish in mere confusion" (Dioptrica, prop. XXXI, p. 118).

This difficulty is dealt with by Berkeley at the end of the section about distance of the New Theory (sect. 29-40) before his discussion of the Molyneux problem. His explanation of the monocular perception of distance well accounts for this difficulty. We judge of distance of near objects not by means of angles, but by means of confusion in the appearance of the object. A point is seen distinctly when the rays flowing from it are reunited by the refractive power of the crystalline on the retina. When an object is near, it is focused behind the retina. The rays from each single point cover a portion of the retina, mixing with rays from other points of the object, causing confused appearance [see p. 142 facsimile diagram, fig. 2, in New Theory, sec. 36]. We are aware only of this ultimate effect and through an experienced constant association we judge by it of the distance. But confused appearance can also arise from converging rays when the point of their conjunction is before the retina [see p. 142 facsimile diagram, fig. 3, in New Theory, sect. 36]. This is exactly what happens in the Barrovian case. As Berkeley says "the eye, or (to speak truly)

the mind, perceiving only confusion itself, without ever considering the cause from which it proceeds, doth constantly annex the same degree of distance to the same degree of confusion. Whether confusion is occasioned by converging or by diverging rays, it matters not" (New Theory, sec. 36).

In our judgment of distance lines and angles are irrelevant, because we associate by experience some visual cues, like confusion, with our immediate idea of distance as it is available to the sense of touch. Anyway, there is a sense in which lines and angles are related to our perception of distance:

Hence also it doth appear there may be good use of computation by lines and angles in optics; not that the mind judgeth of distance immediately by them, but because it judgeth by somewhat which is connected with them, and to the determination whereof they may be subservient (New Theory, sec. 38).

Here Berkeley seems to assume that the world described by the geometric optics exists. The relation between confused appearance as such and distance is certainly customary and there is no necessary connection between them in our experience. But underlying this customary association there is a necessary connection between confused or distinct vision and a certain path followed by the rays of light from the object to the retina. Confusion is necessarily connected with the way rays flowing from a radiating point fall on the retina. Usually the rays do not focus on the retina when an object is near, but confusion can occur also in the purblind and in the Barrovian case when the focus is before the retina, and the object is far. The error of the mathematical approach to perception

is to consider lines and angles in themselves in the judgment of distance and not as the cause of confused vision.

It is true that distance is not perceived by itself, being a line that projects only a point in the retina, but the necessary effect of near distance in case of normal vision, without defect of the eye and the illusion caused by the presence of the lens in the Barrovian case, is confused vision. So there is a sense in which confused appearance is necessarily connected with distance, even if we are not immediately aware of this necessity, and we judge only through a customary association of ideas.

It is certain that at the time he wrote the New Theory Berkeley did not share the view that geometric optics describes a world that exists independently of the mind. At the beginning of the New Theory he says that the lines and angles supposed by optic writers "have no real existence in nature, being only an hypothesis framed by the mathematicians, and by them introduced into optics, that they might treat of that science in a geometrical way" (New Theory, sec. 14). Later in the New Theory he claims that the objects of Euclidean geometry are tangible in their own nature (New Theory, sec. 149-159). In The Theory of Vision Vindicated and Explained, sec. 51, he carefully distinguishes between purely visible pictures (light and colours) and the images on the retina which must be conceived of tangible nature. Since the objects of geometric optics cannot be perceived, when we say that they are tangible we must specify that they are only imagined as tangible. The claim that they do not have a real existence in nature can rest

only on the acceptance of the *esse est percipi* principle of the later works, even if in the New Theory Berkeley temporarily considers the tangible ideas as having external existence (notion in itself contradictory as shown in the Principles of Human Knowledge).

The language of vision which connects the immediate visual ideas to tangible ideas is a natural language (the language of God) which everybody learns and knows. The language of optics is a language which we build on the model of the most important of our senses, the touch, to describe our experience in a mathematical way. The world of optics, in which confusion is interpreted as mixing of the rays flowing from a radiating point on the retina, is a theoretical construct, by which we give account of those phenomena like refraction that are unexpected in the common experience of association between sight and touch (a stick that looks crooked should also feel crooked; an object that looks near to sight, should also be near for the sense of touch). The way this world is constructed out of experience may also be logically necessary, but this does not entail any supposition on its external existence beyond phenomena.

After the description of the Barrovian case, Molyneux says that, following the example of Barrow, he will leave this difficulty to the solution of others,

but with the resolution of the same admirable author, of not quitting the evident doctrine, which we have before laid down, for determining the *locus objecti*, on the account of being pressed by one difficulty, which seems inexplicable, till a more intimate knowledge of the visive faculty be obtained by mortals. In the mean time

I proposed to the consideration of the ingenious whether the locus apparens of the object placed as in this 9th section, be not as much before the eye, as the distinct base is behind the eye (Dioptrica, prop. XXXI, p. 119).

Berkeley refers explicitly to this solution proposed by Molyneux in the section 40 of the New Theory. According to the rule for finding the position of the respective base of a lens given by Molyneux in his treatise, the object would appear always farther than it is. But, as Berkeley remarks, "this manifestly contradicts experience, the object never appearing, at farthest, beyond its due distance" (New Theory, sec. 40).

The Barrovian case is an evidence against the theory that in monocular vision we see distance by means of the divergency of the rays falling on the pupil. But even in other cases, as Molyneux admits at the end of the proposition XXXI, the appearances through lenses of the change of the object place, do not so strongly strike the sense as the doctrine laid down seems to intimate. Referring to Dechales' Dioptrics, he explains that this happens because optic lenses are seldom or never so large as to be looked through by both eyes at once, "for if they were... the locus apparens would be much more plainly and sensibly determined to sight: in this particular he [Dechales] is much in the right; for we see at all times, that the two eyes make a more exact estimate of the position of an object than one single eye" (Dioptrica, lib. XXXI, p. 119).

6. The Perception of Size

In the Dioptrica Nova there is not a detailed account of the way we perceive size by sight. In the proposition XXVIII, where the manner of plain vision with naked eye is expounded, Molyneux simply says that "the magnitude of an object is estimated by the angle the object subtends before the eye" (Dioptrica, prop. XXVIII, p. 106). However, he would have recognized that by the optic angle alone we cannot perceive the magnitude of the external object, which is constant, because objects of different size at different distances subtend the same angle before the eye projecting an image which covers the same number of points on the retina. The perception of the real magnitude of the external object and consequently of size constancy, implies that in our judgment we take into account not only the optic angle but also the distance of the object. So an object that at a far distance subtends a small angle is seen at a nearer distance under a greater angle, though it be judged not varying in its real size. Only if we know the distance of the object can the optic angle show us the real size of the object. This was the theory proposed by Descartes and Malebranche.¹⁶ Molyneux is interested in explaining the changes made by the lenses in the apparent magnitude (what Berkeley calls visible magnitude) and position of the objects and so he does not explicitly say that we perceive real size taking into account distance. But he seems to presuppose this theory.

¹⁶ See Descartes, Dioptrics, Discourse VI, in The Philosophical Writings of Descartes, p. 172, and Malebranche, The Search after Truth, Elucidation XVI, sec. 27, p. 734.

In proposition XXVI he gives a rule for calculating the size of the image in the distinct base of a convex lens: as the distance of the object from the lens to the distance of the image from the lens, so the diameter of the object magnitude to the diameter of the image. Since the eye is considered by Molyneux as a *camera obscura* provided with a convex lens, this rule can be applied also to vision and it implies that for knowing the real size of the object we must know beforehand the other three terms of the proportion: not only the optic angle (or the diameter of the image on the retina) and the distance of the crystalline from the retina, but also the distance of the object from the eye. So external size is perceived by a sort of additional calculation made in an unconscious way on the basis of the first calculation of distance. Since the only objects whose distance can be estimated in a geometrical way are near objects, it seems that we can only make a precise estimate by sight of the size of near objects.

Among the means for judging distance of far objects the optic writers mention size. This would seem to involve a circularity in their theory, because they say at the same time that we judge of size of far objects by distance. We perceive an object as far if the image is smaller than the one it projects at near distance. If two objects appear to have the same visible extension (if they subtend the same angle) we can judge that they are at the same distance and of the same size, or at different distances and of different sizes, only if we previously judged their real size at near distance (which can be calculated geometrically). This

judgment of size must be preceded by the judgment of distance, as we have seen. So even the perception of distance and size of the far objects, in Descartes, Malebranche and the other optic writers, seems to be possible only on the basis of the judgment concerning near objects, which is performed as an unconscious geometric calculation in vision. This seems to be their theory, if we do not consider the obvious intervention of the sense of touch at near distance which they acknowledged to provide the same idea of extension to the mind.

For Berkeley the real constant size is tangible in nature. The idea of tangible size has nothing in common with the visible changing size. So the same immediate visible ideas are perfectly suitable at the same time to suggest distance as well as size. Since he does not suppose that there is any similarity between immediate visible ideas and mediate ideas which, properly speaking, belong to touch, there is no need to make perception of size depend on perception of distance. Visible size, confusion or distinctness, faintness or vigorousness, suggest to mind immediately size as well as distance. This happens because the connection between the visible ideas and the ideas of touch is only customary and based on constant association (see New Theory, sec. 52-66). The reason why we are so prone to confound visible and tangible ideas is that we usually do not pay attention to our immediate ideas, the visible ones. This happens because we consider them not in themselves but only in so far as they suggest tangible ideas which are of vital importance for us, since from them pain, pleasure and all that

concerns the preservation of our (tangible) body derives (see New Theory, sec. 59).

7. *The Moon Illusion*

After showing the manner whereby we perceive size by sight, in the New Theory Berkeley considers the problem of the appearance of the moon on the horizon (New Theory, sec. 67-78). The moon on the horizon seems larger than when it is high in the sky. This illusion was first mentioned by Ptolomy in the second century A.D. and several explanations of the phenomenon had been proposed since then. Molyneux did not discuss this problem in the Dioptrica, but he devoted to it a letter to Halley which appeared, along with a comment of Wallis, in the Philosophical Transactions.¹⁷ In this letter, Molyneux outlined the views of Gassendi, Hobbes and Descartes on the subject. Descartes believed that the moon on the horizon seems larger because it is compared with the different terrestrial objects lying before itself, while such a comparison is not possible when it is high in the sky. Molyneux says that this solution is "much below the usual accuracy of the noble Descartes." He argues that, in this case, the moon should seem larger even when it is seen on the meridian against chimneys or on the top of a hill, which could give a basis for the comparison. Besides, the horizontal moon appears enlarged not only when it is seen against

¹⁷ Philosophical Transactions, XVI, 323-329. See Simms, William Molyneux of Dublin, pp. 62-63.

objects on land, but also when rising on a smooth sea or behind a wall. Molyneux dismissed also the solutions of Hobbes and Gassendi, based exclusively on physical reasons. Berkeley refers explicitly to Molyneux's letter in his New Theory and he also considers in detail the position of Wallis which is similar to the view of Descartes:

Many attempts have been made by learned men to account for this appearance. Gassendus, Descartes, Hobbes, and several others have employed their thoughts on that subject, but how fruitless and unsatisfactory their endeavours have been is sufficiently shewn in the Philosophical Transactions, where you may see their several opinions at large set forth and confuted, not without some surprise at the gross blunders that ingenious men have been forced into by endeavouring to reconcile this appearance with the ordinary principles of optics (New Theory, sec. 75).

Berkeley thinks that the phenomenon can be explained by the fainter appearance of the moon on the horizon. This faintness is due to the vapours and exhalations which intercept the rays flowing from the object. Faintness of the visible idea is connected by an experienced constant association to a larger size in the tangible idea. Moreover, Berkeley's solution can explain why "the horizontal moon doth not constantly appear of the same bigness, but at some times seemeth far greater than at others" (New Theory, sec. 67). Indeed vapours and exhalations can increase from one time to another and, consequently, also the faintness of the image. So, according to M. Atherton "the virtue of Berkeley's explanation, he tells us, is that he has identified a perceptible cue that, unlike the retinal image, varies with the phenomenon in question".¹⁸

¹⁸ Atherton, Berkeley's Revolution in Vision, p. 124.

The case of the moon on the horizon also throws light on the difference between the immediate and mediate object in the visual perception of size. The immediate object of vision, the image, is not larger on the horizon than when it is on the meridian. In fact, as Molyneux remarks in his article, the size of the visual image of the horizontal moon appears slightly smaller. Therefore what appears larger is the mediate object of vision which in its own nature is not visible, but tangible. Only if we recognize that the immediate and mediate objects of vision are not both, properly speaking, visible, we can avoid the absurd situation of trying to explain why the moon looks bigger than it looks.¹⁹

It could be objected that, according to Berkeley's solution, even the meridional moon should seem enlarged if seen through a somewhat opaque medium (New Theory, sec. 72). But, as Berkeley remarks, faintness suggests size in the same way that words suggest meaning in language: not always the same word, if placed in a different context, signifies the same thing (see New Theory, sec. 73). Consequently only faintness on the horizon, which is the usual way things are seen by human beings, suggests a larger tangible magnitude, because other circumstances accompany pure visible appearance in this judgment which are not present in the case of the meridional moon (the usual posture of the head and eyes). It could be asked why, omitting one of these circumstances, we judge the object always smaller and not bigger than as usual. Berkeley simply answers that we find that in our experience the addition of

¹⁹ See *ibid.*, p. 126.

different circumstances is associated with a larger size, in viewing distant objects:

... several circumstances concurring to form the judgment we make on the magnitude of distant objects, by means of which they appear far larger than others, whose visible appearance hath an equal or even a greater extension; it follows that upon the change or omission of any of those circumstances which are wont to attend the vision of distant objects, and so come to influence the judgments made on their magnitude, they shall proportionably appear less than otherwise they would. For any of those things that caused an object to be thought greater than in proportion to its visible extension being either omitted or applied without the usual circumstances, the judgment depends more entirely on the visible extension, and consequently the object must be judged less (New Theory, sec. 73).

These different circumstances that attend the pure visible appearance --as it is determined by visible magnitude, confusion or distinctness, vigorousness or faintness-- are mentioned in section 57: disposition of the eye, figure, number and situation of the objects observed. The addition of these circumstance always modify our perception of size. Berkeley says that the same number of visible points (*minima visibilia*) in the figure of a tower would suggest a larger size than the same visible magnitude in the shape of a man.²⁰ Anyway figure can suggest smaller as well as bigger size. It depends on what particular tangible ideas are associated with particular figures. The same number of faint visible points can be recognized as the figure of what we previously experienced

²⁰ Berkeley presents the doctrine of the *minima visibilia* in New Theory, sec. 79-87. The *minima visibilia* are the smallest and ultimate portions of our visual field. They are indivisible and equal in their dimensions in all kinds of beings endowed with visive faculty (see New Theory, sec. 80). The visual field is constituted by a certain number of *minima*.

by touch as a small object or as a big object. Consequently only the usual posture of the eye seems to be associated with a larger size. So the answer of Berkeley is simply an appeal to experience. There is no intrinsic reason apart from our experience why the omission of other circumstances and, in this particular case, the omission of the usual posture of the head and eyes should not suggest a larger tangible size, since there is no necessary connection between our immediate visible ideas and the tangible ideas.

8. The Perception of Situation and the Inverted Retinal Image

After the sections on distance and size in the New Theory, Berkeley deals with the problem of the perception of situation and, in particular, the problem of the inverted retinal image. According to the writers of geometric optics, the immediate objects of perception in vision are the images painted on the retina, or at least, resemble the images painted on the retina. Since these images of the external objects are painted on the retina in an inverted order, the problem is to explain how we see the objects erect.

Molyneux introduces this problem in the proposition about the manner of plain vision:

We are likewise to observe, that the representation of the object *abc* on the fund of the eye *fed* is inverted [...] And here it may be enquired, how then comes it to pass that the eye sees the object erect? But this enquiry

seems to encroach too nigh the enquiry into the manner of the visive faculties perception; for 'tis not properly the eye that sees, it is only the organ or instrument, 'tis the soul that sees by means of the eye. To enquire then, how it comes to pass, that the soul perceives the object erect by means of an inverted image, is to enquire into the soul's faculties; which is not the proper object of this discourse (Dioptrica, prop. XXVIII, p. 105, see p. 140 facsimile tab. 25, fig. 1, p. 103).

This declaration is in accordance with the empirical method of enquiry laid down in the preface to the work. Notwithstanding this prudence, Molyneux tries to give an explanation of the phenomenon. He first remarks that the terms erect and inverted "are only terms of relation to up and down, or farther from and nigher to the centre of the earth, in parts of the same thing" (Dioptrica, prop. XXVIII, p. 105). To say that something is inverted on the retina means that the parts which are farthest from the centre of the earth are painted nearer to the centre of the earth, "but the eye or visive faculty takes no notice of the internal posture of its own parts, but uses them as an instrument only, contrived by nature for the exercise of such a faculty" (Dioptrica, prop. XXVIII, p. 105).

The precise meaning of this phrase is explained in the following paragraph. Here Molyneux gives an explanation of the erect vision which is essentially similar to that of Descartes and Malebranche.

... let us imagine, that the eye in the point *f* receives an impulse or stroke by the protrusion forwards of the luminous axis *aof*, from the point of the object *a*; must not the visive faculty be necessarily directed hereby to consider this stroke, as coming from the top *a*, rather than from the bottom *c*, and consequently should be directed to conclude *f* the representation of the top?

(Dioptrica, prop. XXVIII, p. 106, see p. 140 facsimile tab. 25, fig. 1, p. 103)

Molyneux remarks incidentally, in the second part of the Dioptrica, that this explication is "allowed by all men as satisfactory" (Dioptrica, par. 2, c. 7, p. 289). Berkeley quotes directly this comment of Molyneux at the end of the section 89 of the New Theory where he summarizes the position of the optic writers concerning this problem.

Though Molyneux's explication is essentially similar to that of Descartes and Malebranche, it is less sophisticated. Even if for Descartes and Malebranche what we immediately see depends ultimately on the images on the retina, they do not identify directly the object of the soul with these images. According to Descartes, the knowledge of the real situation of the external object

does not depend on any image, nor on any action coming from the object, but solely on the position of the tiny parts of the brain where the nerves originate. For this position changes ever so slightly each time there is a change in the position of the limbs in which the nerves are embedded. Thus it is ordained by nature to enable the soul not only to know the place occupied by each part of the body it animates relative to all the others, but also to shift attention from these places to any of those lying on the straight lines which we can imagine to be drawn from the extremity of each part and extended to infinity.²¹

This a fuller account of the physiological mechanism of vision. The path followed by the visual stimulus is described not only until the fund of the eye, but also until the brain. Here some

²¹ Descartes, Dioptrics, Discourse VI, in Philosophical Writings of Descartes, vol. 1, p. 169.

changes in the positions of the points where the nerves originate are interpreted by the soul as a sign of the position of the external object. This connection between the physical changes in the brain and the knowledge acquired by the mind is "established by nature" and by this expression Descartes probably refers to the laws of the union of the soul and body. Descartes remarks that the soul's attention is transferred from the points where the nerves originate to the other extremity. This is illustrated by the example of the blind man who can judge of the object position by crossed sticks. His attention is drawn almost immediately from the extremities of the sticks which he holds in his hands to the opposite extremities. Accordingly, as we have seen, Molyneux says that the eye or visive faculty takes no notice of the internal position of its own parts but uses them only as an instrument for the use of this faculty. However, while it may be true that the blind man does not notice the change in the transfer of attention, he must know the previous position of his hands (which one is upper and lower in relation to the ground) in order to judge the position of the objects. This inference implies that in the judgment of position the soul has a perfect knowledge of the absolute situation of the body's parts in relation to the earth, even if we do not take notice of this knowledge: our attention is drawn instantaneously from the premises to the conclusions of our inference.

This claim that we have knowledge of the absolute situation of our body (of the parts of our retina, or of points in the brain) in

relation to the earth appears from what Molyneux adds as an elucidation of his explication of erect vision:

Hereof we may be satisfy'd by supposing a man standing on his head: for here, tho the upper parts of objects are painted on the upper parts of the eye, yet the objects are judged to be erect. And from this posture of a man, the reason appears, why we have used the words farthest from, and nighest to the centre of the earth, rather than upper and lower. For in this posture, because the upper parts of the object are painted on that part of the eye nighest the earth, (though really the upper part of the eye) they are judged to be farthest removed from the earth (Dioptrica, prop. XXVIII, p. 106).

We do not judge the position of an object painted on the retina in relation to the earth which is painted there (the visible earth, in Berkeley's terms), but in relation to the external earth (the tangible earth, according to Berkeley). In any situation of the body, even when a man stands on his head, the objects which are painted on that part of the retina which is nearest to the real earth are always judged farther from it, because we know, even if in an unconscious way, that the rays of light intersect.

This position is denied by Berkeley for a series of reasons.

First, we are not aware, while perceiving the situation of an object, of the judgment made taking into account the intersection of rays. Consequently the comparison with the blind man is not valid, since he is aware of the positions of his hands and of his judgment.

To judge of the situation of the object by something which is not perceived is not possible since, according to Berkeley's empiricism, an idea which is not immediately available can be suggested only by another immediate idea (see New Theory, sec. 90).

Referring to the Molyneux problem, Berkeley shows that the judgment of situation is about the tangible objects (which in the New Theory are considered external). Only through an experienced constant association between what we immediately see and the tangible ideas of situation may we come to ascribe the situational qualities to the visual field. Since for Berkeley visible objects and tangible objects are heterogenous, there is no spatial relation, as defined by touch, between a visible object and a tangible object. So, it does not make sense to say that a visible object is inverted in relation to the tangible object.

If we conceive the images on the retina as the proper objects of sight, as Berkeley seems to assume sometimes following the theories of optic writers, we can still conceive the apprehension of situation by sight in terms of an association between the visible and tangible objects. Indeed, the felt movement of our head and eyes turning up and down makes us consider uppermost those objects which are painted on the lower part of the retina, and lowest those which are painted on the upper part. Moreover, if we take seriously the claim of the optic writers that the immediate objects of vision are the retinal images, we will understand why we think that we should see things upside down. This happens because we imagine ourselves looking on the fund of somebody else's eye, or someone looking on the fund of our eye. The images on the retina of the eye which we imagine we are looking at are judged inverted not in relation to external objects, which are unseen, but only in relation to the larger images projected on our own eye. But the

first eye sees only its own images, and so there is no inversion in it:

In the forementioned instance the eye A takes the little images, included within the representation of the other eye B, to be pictures or copies, whereof the archetypes are not things existing without, but the larger pictures projected in its own fund: and which by A are not thought pictures, but the originals, or true things themselves (New Theory, sec. 118).

According to C.M. Turbayne, these sections on the problem of the inverted retinal image are central for the interpretation of the New Theory, because here Berkeley confutes the representative theory of perception supported by the optic writers. According to the optic writers, the immediate object of our perception in vision is a picture of the external object painted on the retina. According to Turbayne, Berkeley says that if we suppose that the immediate objects of vision are images painted on the retina, these images cannot be the copies of the external object. Their archetypes are other larger images in our retina, as it is shown in the passage quoted before.

A difficulty in the interpretation of this argument is that even if it shows that images on the retina cannot be copies of the external objects, Berkeley does not explicitly deny that the immediate objects of sight are retinal images. As Turbayne remarks, these images are suspiciously in their own nature like external objects.²² Only in the last section about situation (sec. 119) does Berkeley say that we must carefully distinguish between visible and

²² See Turbayne "Berkeley and Molyneux on Retinal Images," p. 350.

tangible eye, and that certainly on the tangible eye nothing either is or seems to be painted. In the Theory of Vision Vindicated and Explained (sec. 51) Berkeley draws the important distinction between the tangible images which are on the retina, and the pictures made up of light and colours, which are the true and immediate object of sight. Turbayne remarks that Berkeley sometimes assumes that the immediate objects of sight are the retinal images only for the sake of argument and that, in an work on vision like the New Theory, there was little need for him to provide the whole truth as he saw it. In the same manner his confutation of the theory of representation would be addressed only to the optic writers, because the philosophers, like Descartes and Malebranche, never supposed that the immediate objects of sight are images painted on the retina. Only in the later works did Berkeley refute their theory.

According to M. Atherton, Turbayne ascribed erroneously to Locke, Malebranche and Descartes a crude resemblance theory of perception.²³ According to this theory, the idea is not only a representation, but an image or copy of the external object. Descartes explicitly argued against this simulacrum theory.²⁴ Nevertheless, as M. Atherton recalls, he seems to fall into Berkeley's trap, by supposing, just at the beginning of the Fifth Discourse of the Dioptrics, that external objects paint an image in

²³ See Atherton, Berkeley's Revolution in Vision, pp. 169-171.

²⁴ See Descartes, Dioptrics, Discourse VI, in The Philosophical Writings of Descartes, vol. 1, p. 167.

the back of our eye: "You see, then, that in order to have sensory perceptions, the soul does not need to contemplate any images resembling the things which it perceives. And yet, for all that, the objects we look at do imprint quite perfect images on the back of our eyes."²⁵ According to M. Atherton, this is an incoherence in Descartes' treatment of inverted images. Finally even if not a resemblance theory, Descartes supports a representational theory of vision. The ideas we see are not identical but represent the external world with which they share the common quality of extension.²⁶

²⁵ See *ibid.*, Discourse V, p. 166.

²⁶ See Atherton, Berkeley's Revolution in Vision, p. 170.

CHAPTER II

The Relation between Berkeley's Theory of Vision and Immaterialism

1. The Common Sense Objection to Immaterialism: Berkeley's Own Assessment of the Relation between the New Theory of Vision and Immaterialism in the Principles and in the Dialogues

Berkeley published An Essay towards a New Theory of Vision in 1709, while his two works on immaterialism appeared later: A Treatise concerning the Principles of Human Knowledge in 1710, and the Three Dialogues between Hylas and Philonous in 1713.

From his two notebooks, written between 1706 and 1708, we can draw some conclusions regarding the genesis of Berkeley's conceptions. Most of the arguments that appear in his New Theory are in the first notebook and they follow a first set of notes in which Berkeley lays the foundations of his immaterialist doctrine. So, by the time he conceived his new theory of vision, Berkeley was already convinced of immaterialism, and certainly by the time he published his New Theory in 1709 he had already discussed extensively the immaterialist doctrine in his two notebooks.

Different questions arise concerning the problem of the relation between these two theories.

The first problem arises from the fact that in the New Theory Berkeley still conceives the tangible objects as existing without the mind and only the visible objects as existing in the mind. For example, in section 111, dealing with the problem of the perception

of situation, he says:

We say any object of touch is "high" or "low," in proportion as it is more or less distant from the visible earth. But to define the situation of visible things with relation to the distance they bear from any tangible thing, or vice versa, this were absurd and perfectly unintelligible. For all visible things are equally in the mind, and take up no part of the external space; and consequently are equidistant from any tangible thing which exists without the mind (New Theory, sec. 111).¹

In the later works Berkeley argues that even the tangible objects exist in the mind. So, it seems that the theory of vision does not involve or suppose immaterialism, because we can still conceive the tangible objects as external, independent of mind.

Moreover, in the New Theory, Berkeley refers to unobservable entities like rays of light reflected by the objects and crossing and refracting in the eye, and to the contemporary descriptions of the physiology of vision. For example, discussing the Barrow case, Berkeley shows why, looking at an object through a convex lens while the eye is receding from the lens towards its focus, we see the object as if it grew nearer, even if in fact the eye is further than before from it. In this case, Berkeley explains, the rays from each single point of the object converge in different distinct points before the retina. On the retina, the rays from one single point cover a certain portion of it and get mixed with the rays from other points. The resulting image on the retina is confused. We have this same effect on the retina when an object is close to the eyes and the image is focused distinctly behind the retina. According to Berkeley we are accustomed by experience to associate

¹ See also New Theory, sec. 55 and sec. 94.

indistinctness to near distance as experienced by touch, and this is the reason why we are deceived in the Barrovian illusion. It is striking that at the basis of this explanation there is the supposition of rays of light and of confused images on the retina, which are objects independently existing, and, at least in the case of the rays, unobservable. This explanation seems to imply that our visible ideas resemble those physical images, or even perhaps that what we immediately see are those images on the retina.

So, a second problem is to explain the language of optics which Berkeley uses in the New Theory. Even if one argues that it is not difficult to see how the external tangible objects of everyday experience in the New Theory are really internal to the mind, it is not so easy to see how the language of optics can be consistent with immaterialism. The answer to this problem can be found in what Berkeley says in his Theory of Vision Vindicated and Explained, and in the different methods of this later work and of the New Theory (synthetic method vs. analytic method), as I will explain later.

As we have said, Berkeley considers the tangible objects as external, independent of mind in the New Theory. This is borne out in the Principles, where, referring to the New Theory, Berkeley says:

That the proper objects of sight neither exist without the mind, nor are the images of external things as shown even in that treatise. Though throughout the same the contrary be supposed true of tangible objects: not that to suppose that vulgar error was necessary for establishing the notion therein laid down, but because it was beside my purpose to examine and refute it in a discourse concerning vision (Principles, sec. 44).

While the theory of vision did not require that we consider tangible objects external, nevertheless that was presupposed in the New Theory. Whether the tangible objects are internal or external to the mind, this is something beyond the purpose of a discourse concerning vision. So the theory of vision can be adopted even if we consider the tangible objects as external, or representative of external objects. If the theory of vision does not require the immateriality of the tangible objects, it does establish that visible objects are internal to the mind. In the passage quoted above, Berkeley implies that one of the purposes of the theory of vision is to demonstrate the immateriality of the visible objects.

In order to see to what extent the conception that visible ideas are dependent on mind, and do not represent external objects, depends on what Berkeley says in the New Theory, it will be useful to consider in more detail what Berkeley says about the theory of vision in sections 42-44 of the Principles and in the Dialogues. However, I would like first to introduce some important distinctions which are necessary to understand exactly what Berkeley says in these passages.

A first distinction refers to the use of the adjectives 'direct,' 'immediate,' 'proper,' and the opposites 'indirect,' 'mediate,' or 'improper,' when they are applied to the objects of our sense perception. This distinction will also apply to the corresponding adverbs when they describe the act of perceiving these objects.

We may consider the objects of sense perception either in

relation to the particular sense of which they are objects, or in relation to the perceiver in general. When we consider the objects of perception in relation to the particular sense of which they are objects, we use the terms 'immediate,' 'direct,' or 'proper' to designate the objects that properly speaking belong to that sense, while 'indirect,' 'mediate,' or 'improper' objects do not belong, properly speaking, among the apprehensions of that sense. The matter may be illustrated by an example used by Berkeley. We can say that we hear a coach in the street, but what we properly and immediately hear is just a sound. So, according to this meaning, the terms 'immediate,' 'direct,' and 'proper,' refer to the characteristic and possibly distinct objects of the diverse senses. An object may be said to be the mediate, indirect object of a sense. Just in case it is supposed to be the proper object of another sense and there is a relation between the two senses. So the pair immediate/mediate (or direct/indirect, proper/improper) refers to two things strictly connected. On one hand, it refers to the difference between the senses and to the difference between the objects of the senses. On the other hand, just because we have distinguished the senses and their proper objects, the terms refer to a relation between the senses that must be explained in its nature. We do not simply say, for example, that distance is not the object of sight, but that distance is not the immediate object of sight. Hence it must be the proper object of another sense, namely the sense of touch, and we must explain the nature of the relation between sight and touch that justifies the application of the terms

immediate and mediate to the same object (distance) as perceived by two senses.

These reflections can give rise to different questions. For example, we can ask whether the objects of the diverse senses are really different or not; if they are different what is the nature of their difference (specific or just numeric) and of their relation (deductive inference, resemblance, association) which justifies the use of the terms immediate or mediate. It is important to understand, however, that this way of distinguishing 'immediate' and 'mediate' does not presuppose any difference in the ontological status of the objects of perception. Indeed, if we restrict the use of the pairs immediate/mediate, proper/improper, direct/indirect, to the distinction and relation between the objects of the different senses, we do not make any assumption about whether these objects are internal, or external to the mind (dependent, or independent of the mind).

Still, there is a different meaning adopted by philosophers of the pairs of terms immediate/mediate, direct/indirect, proper/improper. According to this meaning, an object is immediate if it is internal to, or dependent on the mind, and it is mediate when it is external to, or independent of the mind. In this case, the pair of terms is not referred to the proper objects of the different senses, but to objects in general, considered in their relation with the mind.

So, we have two uses of the pair immediate/mediate: one concerning the difference between the objects of the senses and the

nature of their relation, another concerning the difference of ontological status between objects internal to the mind and objects external to the mind.

Other ambiguous expressions used by Berkeley are internal/external to the mind and within/without the mind. On the one hand, internal/external to the mind or within/without the mind may be adopted in a purely philosophical sense. An object is internal to the mind, or within the mind, when it is dependent on the mind. It is external when it is independent of the mind. On the other hand, internal/external or within/without may be adopted in a sense that implies a spatial relation of distance between the perceiver and the object perceived. An object is internal to the mind or within the mind, when it is at no distance from the mind (or the seat of the mind in the body), and it is external to the mind or without the mind, when it is at distance from the mind. What is implied in this use is that the mind is localized, has a position in space, which is different from the position of the objects perceived. So to say that something is at distance, means that is not in the same place of the mind, and consequently that it is independent of the mind. The notions of dependence and independence are explained in terms of a spatial relation of contact with or distance from the mind (or the seat of mind). What is important to understand is that, in this manner, distance implies always independent existence. I do not want to say that this notion of independence, explained in terms of distance from the mind, is something that can be ascribed exclusively to

philosophical doctrines. It is derived from the common experience of distinguishing between "here" and "there" in our visual perception of distance.

In the Principles, Berkeley introduces his theory of vision in responding to an objection against immaterialism which is typical of common sense, because it relies on the experience of a distinction between "here" and "there" in the visual perception of distance.

It will be objected that we see things actually without or at a distance from us, and which, consequently, do not exist in the mind, it being absurd that those things which are seen at the distance of several miles should be as near to us as our own thoughts (Principles, sec. 42).

According to the common-sense view presented in this objection, seeing something at distance, means seeing something that is independent of the mind. Distance between the object perceived and the perceiver implies the independent existence of the object perceived because the mind is situated in a place which is different, at distance, from the object. Now, Berkeley answers this objection with an argument taken from Descartes and Malebranche, the dream argument:

In answer to this, I desire it may be considered, that in a dream we do oft perceive things as existing at a great distance off, and yet for all that, those things are acknowledged to have their existence only in the mind (Principles, sect. 42).

We must first notice that a common assumption of the objection and of the dream argument is that objects appear to our sight to be at distance (and consequently external), that is, that distance is the immediate, proper object of sight. This immediate appearance of

distance to sight seems to show by itself that the objects we immediately see are at distance from us, located in a different place than the mind, and consequently independent of us. This is indeed what I identified as the position of common sense: the objects I see are out there, not where I am. Now, the dream argument shows that the objects just appear to be at distance, and consequently independent, without really being independent of the mind. Thus, vision seems to have paradoxical characteristics: objects appear to be at distance, and yet they are not at distance. One may try to solve the difficulty by redefining distance independently of any notion of independence from the mind, and this can be done by refusing to ascribe any particular place ("here") to the mind.

Still, if we follow the account given in section 43, Berkeley tries to solve the difficulty in another way.

But for the clearing of this point, it may be worth while to consider, how it is that we perceive distance and things placed at distance by sight. For that we should in truth see external space, and bodies actually existing in it, some nearer, others farther off, seems to carry with it some opposition to what hath been said of their existing nowhere without the mind. The consideration of this difficulty it was, that gave birth to my Essay towards a New Theory of Vision, which was published not long since. Wherein it is shewn that distance or outness is neither immediately of itself perceived by sight, nor yet apprehended or judged of by lines and angles, or anything that has necessary connexion with it: but that it is only suggested to our thoughts, by certain visible ideas and sensations attending vision, which in their own nature have no manner of similitude and relation, either with distance or things placed at distance (Principles, sect 43).

The problem, as I said, is that the immediacy of perception by sight of distance seems to imply that the objects perceived are at

distance, and hence external. Berkeley says that visible objects do not even look or appear to sight to be at distance, that is to say, distance is not the immediate, proper object of sight. In saying that objects do not even appear immediately to sight to be at distance, Berkeley seems to accept a presupposition which underlies the common-sense objection. If objects appeared to be at distance, they would be at distance, external. But objects do not appear at distance, so they are internal, they are "here". In this manner, he seems to retain the meaning of distance as implying localization of the mind in the body, and the consequent definition of dependence and independence on the mind. Objects of vision are at no distance from us, in the same sense that they are at no distance from our eyes, from "here". In section 43, we can also notice the import of this problem of common-sense in relation to the use of the terms immediate and mediate. The common-sense objection seems to connect the character of immediacy of an object of perception, its availability to a particular sense, with its ontological status in relation to the mind. The fact that distance is among the objects proper to sight shows that the objects seen at distance are at distance.

We can try to sum up our analysis of the sections 42 and 43 of the Principles: 1) according to the common-sense objection, the proper objects of sight are at distance from us, and consequently independent of us; 2) the dream argument shows that the proper objects of sight are dependent on us; 3) this means that they appear at distance and they are not; 4) Berkeley seems to think

that this is a contradiction in our experience: the proper objects of sight are at distance and they are not (that is, they are independent and they are not); 5) Berkeley says that the proper objects of sight are at no distance, and so they are dependent on the mind; 6) so he does not seem to separate the notion of distance from the notions of independence and dependence on the mind.²

I think it is important to realize that whether distance is the proper object of sight or not, whether it is perceived immediately or not by sight, is a question that must be separated from the question of its dependent or independent existence on the mind. But this is possible only if we separate the notions of independence and dependence from the notion of distance. Berkeley seems to be aware of this in the Dialogues. Just at the end of a series of arguments against the common-sense objection by which he tries to show that distance is not the proper object of sight, Berkeley makes the following remark:

But allowing that distance was truly and immediately perceived by the mind, yet it would not thence follow it existed out of the mind. For whatever is immediately perceived is an idea: and can any idea exist out of the mind? (Dialogues, I, p. 202).

The common sense objection connected the fact that distance is among the proper objects of sight with its external existence. Berkeley replies that even if distance were truly and immediately perceived by the mind through the sense of sight it would not be external. Here, Berkeley means by "immediately perceived" the

² This sort of interpretation of the New Theory can be found in D. M. Armstrong, Berkeley's Theory of Vision (Melbourne: Melbourne University Press, 1960), pp. 26-32.

object that properly speaking belongs to one sense. As I said, in this case, the expressions immediate/mediate refer to the contents of sense-experience, without any assumption of their internal or external existence. Berkeley adds that whatever is immediately perceived, must be an idea, and hence internal to the mind. In this case he is speaking of the objects of senses in general. According to Berkeley, each particular sense has its own proper object and what we call the mediate object is just the proper object of another sense. Now, it is possible to demonstrate that the proper objects of the senses are ideas, and hence internal, "immediate", in the second ontological meaning distinguished above, on the basis of arguments that have nothing to do with distance perception. We must show that the objects of sense perception are dependent on the mind, and this can be done in the best manner starting from the principle *esse est percipi*.

We may try to draw some conclusion regarding Berkeley's contention that the internal existence of the objects of sight was demonstrated in the New Theory. Berkeley thought in his interpretation of the New Theory in the Principles, that a demonstration of the fact that we do not immediately perceive distance would entail the internal existence of the objects of sight, that is, their dependence on the mind. But he could say so only because he failed to separate the notions of independence and dependence on the mind from the notion of distance. The immateriality of the objects of the senses, as it is recognized in the Dialogues, must be demonstrated independently of any discourse

concerning the immediacy of perception of distance by sight. This internal existence of objects of senses must be demonstrated above all on the basis of the *esse est percipi* principle. So the immateriality of the objects of visual perception is not really demonstrated by the New Theory, unless one retains a meaning of distance which implies independence from the mind.

2. Language Model and Immaterialism: The Theory of Sensory Representation.

Although in the Principles Berkeley says that one of the purposes of the New Theory was to show that visible objects are internal to the mind, we find that in the text of the New Theory this is more a premise than a point that needs to be demonstrated. It is a premise that Berkeley shares with other philosophers. Indeed, what Berkeley recognizes as the main task of the New Theory is to show that our visible ideas are not images of external things, and that we do not see distance and other spatial properties by means of lines and angles, that is, by means of something that has necessary connection with them. Now these external objects, as well as distance and other spatial properties, are identified in the New Theory with tangible objects. So, we see that the main argument of the theory is to show that visible objects do not resemble and are not necessarily connected with tangible objects. Hence, the main thesis of the New Theory is the heterogeneity of sight and touch. Objects of sight and touch are

heterogeneous because they do not have any property in common and are not necessarily connected. Consequently, visible objects represent tangible objects through customary association. The internal existence of the objects of sight and the internal existence of the objects of touch need to be demonstrated independently of any discourse concerning their heterogeneity. The heterogeneity thesis regards indeed the relations between the objects of the senses, more than their status as internal or external to the mind. This is why Berkeley can speak indifferently of tangible objects as external in the New Theory and as internal in his later work.

Still, the theory of vision has importance for immaterialism. Once we have demonstrated, by independent argument, that the objects of our senses are internal to the mind, the heterogeneity thesis may show that it is impossible to abstract any common ideas from sight and touch. So, it becomes impossible to conceive the ideas of sight and touch as representative of the same underlying material reality. Of course, one could say that even if it is possible to abstract a common idea of extension from sight and touch, this would not necessarily lead to the postulation of an external reality. It would be possible indeed to conceive extension as an *apriori* form of our sense perception. But this kind of thought is totally foreign to the strict empiricism of Berkeley.

M. Atherton and C.M. Turbayne suggest that the theory of vision with its understanding of what visual representation is may help us to understand the later works; what would be interesting in

Berkeley's later works would be his explanation of the way our ideas represent.³ Even if the main purpose of these later works is to show that for a thing to be is to be perceived, and that there is not an unperceived and unperceiving substance (matter), Berkeley tries also to give a positive account of how our ideas represent. Our ideas can represent only other ideas of a different sense, in the manner of visual language, through customary association. This customary association of ideas, which do not have any resemblance or necessary connection between them, suppose a regularity in the succession of ideas of sight and touch that can only be established by God. So, what really seems to connect the New Theory and the later works is the way Berkeley conceives the representative function of ideas in all these works. In the New Theory, the visible ideas constitute a language whereby we can expect what tangible ideas will affect us, and consequently we can regulate our actions:

The proper objects of vision constitute a universal language of the Author of nature, whereby we are instructed how to regulate our actions in order to attain those things that are necessary to the preservation and well-being of our bodies, as also to avoid whatever may be hurtful and destructive of them (New Theory, sec. 147).

Visible ideas represent ideas of another sense, tangible ideas, in the same manner as words of a language represent their meaning. There is no necessary connection or resemblance between the sign and the thing signified. We come to know what our visual

³ see Atherton, Berkeley's Revolution in Vision, pp. 215-229, and C.M. Turbayne, "Editor's Commentary," in Berkeley, Works on Vision, pp. xli-xlv.

ideas represent only through experience, that is to say, customary association. Condition of the formation of the habit of association between ideas of sight and touch is a certain regularity of succession of the ideas of sight and touch, a regularity that can only be established by God. This is the way we learn to see distance, size and situation in vision.

This account of vision as a language in which visual ideas stand for the heterogenous tangible ideas replace an account of vision in which what we see resembles and is necessarily connected to an external world.

According to Berkeley, ideas of sight and touch lack any resemblance and they relate as words in a language relate to their meaning. So vision is just a matter of relating two different kinds of sensory ideas. In the visual language visible ideas represent other sensory ideas, tangible ideas. As M. Atherton remarks, visual language can be understood as a special case of what is generally the way the different sensory ideas relate to each other.⁴ Ideas do not represent an independently existing world, but other ideas, and, consequently, the knowledge of the natural world is in our grasp. If we conceive our ideas as representative of an external world it is inevitable that we doubt the reliability of our senses in representing this world. But if our ideas represent other ideas, scepticism is avoided. This picture of human knowledge appears in some passages of the Principles and of the Dialogues, as M.

⁴ see M. Atherton, Berkeley's Revolution in Vision, p. 218.

Atherton explains in her book.⁵ For example, she recalls the passage in the Principles where Berkeley says:

That food nourishes, sleep refreshes, and fire warms us: that to sow in the seed-time is the way to reap in the harvest, and, in general, that to obtain such and such ends, such and such means are conducive, all this we know, not by discovering any necessary connexion between our ideas, but only by the observation of the settled laws of Nature, without which we should be all in uncertainty and confusion, and a grown man no more know how to manage himself in the affairs of life than an infant just born (Principles, sec. 31).

So if in the New Theory Berkeley seems to attack the thesis that vision gives us knowledge of mind-independent spatial properties, in the later works he enlarges his scope to include every conception of an independently existing material substance.

Taking into account what I said in section 1, it is important to underline a point, which may be not so evident. I said that the arguments for heterogeneity are in themselves independent of any assumption on the internal or external existence of the visible and tangible objects (although Berkeley thought that visible objects were internal). What they assume is that visible objects are perceived immediately by sight and tangible objects are perceived immediately by touch. So the only requirement of the New Theory is that sensible objects must be perceived, but it would be possible to conceive them indifferently as internal or external, although the notion that a sensible object may exist independently of the perceiver may sound strange. Still, it is Berkeley himself who, although provisionally and not in accordance with his real thought

⁵ See *ibid.* pp 215-220.

on the subject, speaks of tangible objects in the New Theory as being both perceivable and external. So the theory of vision could be adopted both in the metaphysical framework of phenomenalism and in the framework of direct realism. What this theory of representation would oppose is that sensible objects represent objects that are not perceivable by the senses at all. That the objects of the senses are dependent or independent of the mind is a further point of demonstration, and Berkeley thinks that if something is perceived, it can only exist in the mind. So in the framework of Berkeley's immaterialism, demonstrated above all on the basis of the *esse est percipi* principle, to say that sensible objects do not represent objects beyond the senses is tantamount to saying that ideas internal to the mind do not represent external matter.

The knowledge of the natural world is just knowledge of the regularities in our sense-experience. The objects to which we ascribe nouns are just collections of different ideas which recur together in our experience. These ideas do not have any necessary connection or resemblance between them. This view of what Berkeley understands as human knowledge appears in this passage from the Dialogues:

Hence it follows that when I examine by my other senses a thing I have seen, it is not in order to understand better the same object which I had perceived by sight, the object of one sense not being perceived by the other sense. And when I look through a microscope, it is not that I may perceive more clearly what I perceived already with my bare eyes, the object perceived by the glass being quite different from the former. But in both cases my aim is only to know what ideas are connected together; and the more a man knows of the connexion of ideas, the

more he is said to know of the nature of things. What therefore if our ideas are variable; what if our senses are not in all circumstances affected with the same appearances? It will not thence follow, they are not to be trusted, or that they are inconsistent either with themselves or anything else, except it be with your preconceived notion of (I know not what) one single, unchanged unperceivable, real nature, marked by each name: which prejudice seems to have taken rise from not rightly understanding the common language of men speaking of several distinct ideas, as united into one thing by the mind (Dialogues, III, pp. 245-246).

In this passage, as well as in others in the later works, Berkeley does not use the same terminology of the New Theory. He does not refer to the relation sign-signifier in language. However, it is evident that the connection between ideas of different senses, or among ideas of the same sense at different times, is understood in the same manner. Knowledge consists in learning the connection which exists between ideas. Since this connection does not imply any resemblance or necessary connection between ideas, we may come to know it only through experience, that is, actually observing and experiencing how ideas succeed each other. The notion of an unchanged unperceivable substance arises because we do not understand the nature of language used by common men who ascribe a single name to a collection of ideas recurring together.

3. Inconsistencies between the New Theory of Vision and the Later Works: The External Existence of the Tangible Objects.

If we understand immaterialism as a doctrine according to which Berkeley not only claims that what we perceive is ideational, but

tries to explain how ideas can represent, visual language is just an example of what constitutes in general our representative knowledge of the natural world.

As M. Atherton says, this reading of the later works of Berkeley in the light of the New Theory is possible only if these works are consistent.⁶ Now in the New Theory, as we have said, Berkeley considers the tangible objects as external. It is true that in the Principles Berkeley says that this "vulgar error" was not necessary for establishing the explanation of visual perception laid down in the New Theory. Is this notion that tangible objects are external only a dispensable element in the New Theory, as Berkeley seems to say? If this notion of the external existence of the tangible objects, or of their representing an external space, is necessary in order to establish the particular explanation of visual perception of distance, size, and situation, given by Berkeley, then the thesis of the continuity between the New Theory and the later works would not be valid.

However, Berkeley seems not to think that his explanation of visual perception relies on the assumption of an external absolute space. It is true that in the New Theory he commits the "vulgar error" and speaks as if our visual ideas suggest to us tangible objects which are located in absolute space. But in the Principles he translates this language concerning tangible objects. In the passage where he admits to the "vulgar error" committed in the New Theory, he says:

⁶ See *ibid.*, pp. 218-219.

So that in strict truth the ideas of sight, when we apprehend by them distance and things placed at a distance, do not suggest or mark out to us things actually existing at a distance, but only admonish us what ideas of touch will be imprinted in our minds at such and such distances of time, and in consequence of such and such actions (Principles, sec 44).

So, according to Berkeley, the tangible objects suggested by the visible ideas are not things existing independently of the mind. It is to be noticed that Berkeley identifies objects existing independently with "things actually existing at a distance." In the previous section, Berkeley had argued that distance does not appear immediately to sight, but only to touch. Now, he seems to say that distance, as apprehended by touch, must not be understood as distance between the mind and the object perceived in an independently existing space, where they both are as things situated in particular distinct places, but as "distance of time." Seeing an object at distance means that a visible idea suggests to us, by mere customary association, that after walking or reaching out our arms (all actions perceivable by the sense of touch) for a certain time, we will have a particular idea of touch.

In addition to the problem of the external existence of tangible objects, there is the problem raised by the extensive use of the language of optics in the New Theory. As I mentioned before, Berkeley talks about entities like rays of light reflected by the objects, crossing and refracting in the eye, and forming images on the retina. As I explained above, Berkeley seems to found his explanation of the Barrow illusion, and of the moon illusion, on these entities which seem conceived as independently existing and

also as unobservable.

These two problems I mentioned are dealt with in detail by M. Atherton in her book, and I will try to summarize and comment upon her arguments.⁷

As I said, Berkeley in the New Theory speaks sometimes as if the tangible objects were external to and independent of mind. Vision is a language in which visible objects are signs which stand for the tangible objects, the things signified. Now, it may be argued that tangible objects are suitable to be things signified in the visual language just because they are external and independently existing. There is an asymmetry between the signs of the visual language, the visual ideas, which are internal to the mind, and the meanings, the tangible objects, which are really external. In the Principles this asymmetry is lost because the tangible objects no longer mark out locations and figures of an absolute space, but are just considered as ideas, on the same footing with visual ideas.

In the Principles it would appear that just as visual ideas are signs of what we will touch, tangible ideas can be signs of what we will see. In short, the doctrine of a visual language can be defended only if its referents have a different ontological status than its signs, that is to say, only if the tangible objects are external, otherwise the asymmetry which defines vision as a language would be lost. Warnock, who raises this objection, explains his point with a good example:

⁷ See *ibid.*, pp. 221-31.

What we see is a sign of what we could touch, that is to say, of what is really there; just as a man's name painted on the door indicates that the man himself is to be found behind it. As the man himself is not a sign, so also what we touch is not a sign. It is the real thing; and God's visual language merely serves to point it out to us.⁸

Now, according to Atherton, the asymmetry on which divine visual language rests does not depend on a different ontological status of the things signified, the tangible objects. Tangible things are not suitable to be the meaning of this language because they are located in an absolute space and have a mind-independent size and shape. The asymmetry of visual language is not justified by a different ontological status of visible and tangible ideas, because they can both be conceived as ideas, dependent on our minds. The asymmetry is justified by the different content of the ideas of sight and touch, or, in Cartesian terms, not by a difference in the formal reality, but by a difference in the objective reality of these two kinds of ideas. This is why the "vulgar error" of the New Theory is only an extrinsic or dispensable element, and the few passages where Berkeley commits it can be translated or interpreted in a way consistent with the later works. As M. Atherton remarks, what makes the objects of sight signs, and the objects of touch meanings in the visual language is not considering the first internal and the latter external.⁹ Visual ideas can only be signs because their contents lack of any usable spatial information which is provided only by touch: "Reaching out

⁸ G.J. Warnock, Berkeley (London: Penguin, 1953), p. 43.

⁹ See Atherton, Berkeley's Revolution in Vision, pp. 222-223.

and touching is a way of experiencing the distance and situation of things, and for this reason distance and situation are among those things whose nature is an immediate object of touch."¹⁰ Moreover, we learn size and shape through touch, because tangible size and shape are stable and so responsive to measurement, while visual size and shape are variable (if and how the existence of visual size and shape affects the heterogeneity thesis is a problem I will leave aside). As M. Atherton clearly explains, what finally justifies the assumption of the tangible ideas as the meaning-like part of the visual language is that they are more interesting and of vital importance to us: it is by touch that we experience what may be painful or even lethal to us. That is why God provides us with this visual language, so that we may preserve our lives in the most pleasurable way, as appears from the passage quoted above of the New Theory, sec. 147.

M. Atherton considers two other objections which are based on the same misunderstanding of what is the justification of the asymmetry sign-signifier in the visual language. I will shortly consider them.¹¹

A.A. Luce, for example, argues that according to the ontology adopted in the Principles ideas of sight and touch are both sense-data, that is, ideas internal to the mind. So Berkeley can no longer defend the heterogeneity thesis on which his theory of

¹⁰ Ibid., p. 222.

¹¹ See *ibid.*, pp. 223-29.

visual language rests.¹² But, according to Atherton, the heterogeneity thesis is about the content of ideas, not about their ontological status as mind-dependent. What Berkeley wants to show is that the visible ideas represent tangible properties not by any resemblance or necessary connection, but just by a customary connection: this is why it is important to show that these two kinds of ideas lack any common content. This thesis is, by the way, directly connected with immaterialism, because if the ideas of sight and touch lack any common content, we cannot postulate any common object to which they both refer as representations.

In the Principles, Berkeley makes use of a different principle than the heterogeneity principle, namely, the likeness principle that an idea can be like nothing but another idea. According to M. Atherton, the difference between the two principles is only of emphasis.¹³ In the New Theory Berkeley tries to give an account of visual perception, of how visual ideas relate to tangible objects which are suitable to provide us with spatial information, and he stresses the lack of any common content between the two sets of ideas. In the Principles he wants to show directly that ideas cannot represent mind-independent objects and this is the reason why he says an idea can be like nothing but another idea. That the principles of the New Theory (heterogeneity) and of the Principles (likeness) are consistent is shown by the passage of the Principles

¹² See A. A. Luce, "Editor's Introduction," in The Works of George Berkeley, Bishop of Cloyne, eds. A. A. Luce and T. E. Jessop (Edinburgh: Thomas Nelson and Sons, 1948-1957), vol. I, p. 151.

¹³ See Atherton, Berkeley's Revolution in Vision, p. 224.

where Berkeley introduces the likeness principle: "a colour or figure can be like nothing but another colour or figure" (Principles, sec. 7). A colour can be like another idea with the same content, but cannot be like an idea of touch, unless we consider the ideas of different senses not in their content, but for their formal reality, that is to say, the fact that they are all mind-dependent.

M. Atherton considers also the objection raised by Tipton which is based on the same misunderstanding of the heterogeneity thesis as those of Warnock and Luce. This objection seems more puzzling than the others, just because Tipton refers directly to the problem of the perception of distance.¹⁴

In the New Theory, Tipton says, Berkeley argues that we learn distance directly through touch, reaching out our arms, and walking and bumping into objects. We learn to recognize distance in this way, because there are really objects placed at distance from us, and hence independent of us, that can be felt by touch. But, according to Tipton, in the later works the objects perceived by touch are no longer at distance, because they are considered internal to the mind. Again, M. Atherton replies that distance is something perceiver-dependent and that to be at distance in Berkeley's view is not to be independent of us. Distance is exactly the felt experience of reaching out our arms, or walking until we feel something solid. Even distance perception through touch can be

¹⁴ See ibid., pp. 225-229, and I.C. Tipton, Berkeley, the Philosophy of Immaterialism (London: Methuen, 1974), p. 314.

translated in immaterialist terms, so that distance can be considered as a kind of experience (reaching out our arms, walking, etc.). So this is not an argument showing an inconsistency between the New Theory and the later works.

Still, contrary to M. Atherton, I think there is something striking to common-sense in all this explanation of distance perception by touch that affects Berkeley's immaterialism. The blind man who perceives distance by touch, walking and then feeling something solid thinks that what he perceives as solid continues to exist once it is no longer perceived. In Berkeley we do not find a satisfactory explanation of the reason why in common-sense we erroneously think that what is at distance (what we will feel after walking for a certain time, or after reaching out our arms, in Berkeley's terms) is external, in the sense of independent of us. His only explanation is that while we do not perceive objects, objects continue to be perceived by God. But this is a conclusion we reach only when we think philosophically on the problem of the continuous existence of the objects of our perception, and not in our immediate experience.

It is true that Berkeley thinks that his doctrine is more in accordance with common-sense than the doctrines of the philosophers. Nevertheless, I think that he seems not to understand the problem of common-sense as will be later outlined by Hume in the part IV, Book I of the Treatise. In section 54 of the Principles he admits that "men may be said to believe that matter exists, that is, they act as if the immediate cause of their

sensations, which affects them every moment and is so nearly present to them, were some senseless unthinking being." He conceives this belief in a "senseless unthinking being" not as a belief in the continuous and independent existence of the objects of perception themselves, as Hume recognized, but of their cause. So he deems the expression "senseless unthinking being" as devoid of sense.

4. Inconsistencies between the New Theory of Vision and the Later Works: The Language of Optics.

Another seeming inconsistency between the New Theory and the later works is due to the use of the language of optics in solving problems like the Barrovian case, or the moon illusion.

I have already mentioned Berkeley's explanation of Barrow's case in the New Theory (sec. 29-40). Objects which are near the eye are focused behind the retina. The rays from each single point of the object cover a certain portion of the retina and get mixed with rays flowing from other points. The resulting image on the retina is confused. We have the same effect in the Barrovian case when the image of a further object is focused before the retina because of the convex lens which is before the eye. We associate in our experience confused appearance with near distance, and this the reason why in the Barrovian case we are deceived and we think that an object is nearer while in fact it is farther than before.

Now, even if in our experience we are not aware of lines, angles, and rays refracting in our eyes, Berkeley seems to suppose that what we immediately see, in this case a confused appearance, ultimately and necessarily depends on what happens on the retina, or even resembles a supposed image on the retina. What happens on the retina depends on the path followed by the rays flowing from a point of a distant object. This is what appears from what Berkeley says in section 38 of the New Theory:

Hence also it doth appear there may be good use of computation by lines and angles in optics; not that the mind judgeth of distance immediately by them, but because it judgeth by somewhat which is connected with them, and to the determination whereof they may be subservient (New Theory, sec. 38).

It seems to follow that underlying the psychology of vision of the New Theory there is a supposition of material entities, of the world of geometric optics. Furthermore, this is a world that is composed of particles too small to be perceived.

In the same manner the moon is seen larger on the horizon because the atmosphere intercepts some of the rays flowing from the objects. As I mentioned earlier, in our experience we associate faintness with larger objects and this faintness seems to depend on this interception of rays.

Certainly Berkeley did not conceive that his references to this language of optics implied an admission of the external existence of these entities. Just at the beginning of the New Theory he says that lines and angles "have no real existence in nature, being only an hypothesis framed by the mathematicians, and by them introduced into optics, that they might treat of that

science in a geometrical way" (New Theory, sec. 14). In the same New Theory he says that the objects of Euclidean geometry are tangible in their own nature (New Theory, sec. 149-159). In the Theory of Vision Vindicated and Explained Berkeley makes clear that the entities of the geometrical optics must be conceived as tangible in their own nature: "The retina, crystalline, pupil, rays, crossing refracted and reunited in distinct images, correspondent and similar to the outward objects, are things altogether of a tangible nature" (TVV, sec. 49). Hence, according to Berkeley, we must distinguish between the tangible image on the retina and the visible figure, made of light and colour, which is the proper object of vision. Those entities need not to be actually felt by us in order to be considered tangible. Berkeley says it sufficient that they may be imagined as tangible:

And here it may not be amiss to observe that figures and motions which cannot be actually felt by us, but only imagined, may nevertheless be esteemed tangible ideas, forasmuch as they are of the same kind with the objects of touch, as the imagination drew them from that sense (TVV, sec. 51).

Geometrical optics is simply a model that we build on the basis of our most important sense, the touch, so that we may describe our experiences, in using lenses, in a geometrical way. The language of vision which connects the immediate visual ideas to the tangible ideas is a natural language (the language of God) which everybody learns. The language of optics is a construct that gives account of certain phenomena of visual experience that otherwise would appear exceptions to the normal functioning of

visual language, as I explained in my discussion of the Barrovian case in the first chapter.

So the language of optics used by Berkeley can be interpreted and translated, according to Berkeley's conception of science, in terms which are perfectly consistent with immaterialism.

We can ask why Berkeley adopted this language of optics without making clear immediately the way it should have been interpreted. I assume that he was not clear enough in the New Theory just because in fact there have been misinterpretations of the New Theory on this issue. My opinion is that this can be explained by the different methods adopted in this first work and in the later Theory of Vision Vindicated and Explained. In the New Theory Berkeley adopts what he calls the analytic method. He starts solving problems concerning the vision of distance, size, and situation, and applying his solutions to the Molyneux case he shows the complete heterogeneity of sight and touch, and that vision is a language in which we associate by experience visible objects with tangible objects. In the Theory of Vision Vindicated and Explained he starts from the principles of heterogeneity and of vision as a language, and he applies them to the solutions of the particular problems of vision (distance, size, and situation). Now, on the way to discovering these principles in the New Theory, dealing with the problems of distance and size perception, Berkeley uses geometrical optics. In the Barrovian case his main point is that we do not perceive angles and lines, and consequently we do not perceive distance on the basis of a divergency or convergency of rays, but

only on the basis of an association of confused appearance with distance. His explanation does cohere very well with the supposition of the geometric world his adversaries consider really existing, but it is clear that, by the end of the New Theory, this world of geometric optics can be considered only as composed of "imagined tangible objects." In short, I think that this use of geometric optics is only a piece of strategy: Berkeley makes use of the theories of his adversaries in order to change their ideas on some issues (distance and size perception), but in the meantime he completely alters the ontological status of the elements of their world.

5. Conclusions: Visual Language and the Laws of Nature; Scepticism and Atheism.

I tried to show that the inconsistencies between the New Theory and the later works do not prevent a reading of Berkeley's immaterialism in the light of the new theory of vision. In the New Theory Berkeley shows that vision works as a language in which visual ideas stand for tangible ideas which provide spatial information. There is no necessary connection or resemblance between what we immediately see and what we mediately see, which properly belongs to another sense. We learn this language only by experience. So our visible ideas do not represent or are not necessarily connected to an external world, but represent other ideas. In the same manner, in the more general framework of the later works, our ideas can represent only other ideas through a

customary association. The fact that ideas are internal to the mind, and not external, is an important part of Berkeley's conception, but must be understood only as a premise.¹⁵ Even the Cartesian philosophers agree in their rejection of the claim of common sense that our ideas have an external existence, but they think that they represent an external, independently existing substance. Berkeley shows that it is absurd to think that our ideas can represent this external substance. Our ideas represent other ideas of a different sense only through a customary association which implies no resemblance or necessary connection.

The theory of vision is particularly relevant for the establishing of immaterialism, because if we show that the visible ideas and the tangible ideas lack any common content, if we cannot abstract a common idea of extension from sight and touch, we can no longer suppose or postulate an object identical to this abstract extension to which our ideas could refer as two different ways of being affected by the same independently existing thing (the Cartesian extension).

The conception of representation as customary association of non-resembling ideas as a way for solving problems of visual perception can make us understand how Berkeley can conceive in the later works how, in general, ideas relate to each other, and how we come to ascribe names to collections of ideas. What we call an object is made up of different sense-qualities. If, seeing a tree,

¹⁵ See Atherton, Berkeley's Revolution in Vision, p. 231-236.

its tangible qualities are called to mind, so feeling the tree while we are blind-folded, its visual idea is called to mind.

Still, contrary to M. Atherton, I think it is necessary to make some distinctions. Only vision constitutes a real language. In the Alciphron (dialogue IV, sec. 12) Berkeley says that only in vision do we have "the articulation, combination, variety, copiousness, extensive and general use and easy application of signs that constitute the true nature of language". Contrary to visual ideas, the ideas of the other senses can work as signs of other ideas, but they do not have the articulation of the language of vision.

Vision has a privileged status, because his signs in their rich articulation refer to tangible ideas and, as I said before, the knowledge we have through vision of what tangible ideas will affect us is of vital importance to us. The sense of touch seems to be the most important in Berkeley's conception, because it is particularly through touch that we experience pains that are directly connected to our survival. Indeed touch, in its wider sense including every kind of tactile and kinaesthetic experience, is what ultimately constitutes our body in Berkeley's view. In fact we can be deprived of vision, smell, hearing, and taste without ceasing to be, but we cannot lack of some tangible experience as long as we are alive. This is why it is so difficult to think about the experience of a disembodied spirit, while we can have some idea of what it is like to be blind and deaf. If there is something it must be perceived and it seems that in Berkeley's view it must be

perceived at least by touch, if not by the other senses. So it seems that the tangible properties are the basic features of our reality (of our experience), according to Berkeley. This is the reason why the unperceived objects of optics must be conceived and imagined as tangible.

Sensory representation must be conceived as an association of different sense-qualities, or of qualities of the same sense experienced at different times, but regularly connected (this is why we come to ascribe the same name to the thing seen at the microscope and the thing seen with the naked eye). So knowledge of nature is in our grasp. There is no hidden essence lying behind our perceptions. In this way Berkeley can claim to have overthrown the scepticism inherent in a conception of knowledge in which our ideas represent an external reality that is, by definition, unperceived and unperceivable. Moreover, as M. Atherton underlines, different qualities relate to each other without any necessary connection, and so are no longer conceived as flowing from a unique essence.¹⁶

As Berkeley says:

One great inducement to our pronouncing our selves ignorant of the nature of things, is the current opinion that everything includes within it self the cause of its properties: or that there is in each object an inward essence, which is the source whence its discernable qualities flow, and whereon they depend (Principles, 102).

In this way, according to M. Atherton, Berkeley replaces a conception of science which is based on an essentialist model and

¹⁶ See *ibid.*, pp. 236-240.

which implies scepticism with a different model in which we detect regularities in the phenomena.

Of course there is a difference between the natural language of vision, or the common experience of relating ideas in our everyday life, and science.

Visual language and in general common experience are languages which we all know, because we learned them in our early childhood. Everybody knows that the food nourishes and the fire warms, to use Berkeley's examples. The laws of nature, on the contrary, are detected through a methodic observation of regularities of phenomena. We come to discover analogies and harmonies in the works of nature (the phenomena), and to subsume them under general laws (Principles, sec. 105). But the knowledge we have in science is not knowledge of the real cause or essence of phenomena, and in this regard science is not different from common-experience:

If therefore we consider the difference there is betwixt natural philosophers and other men, with regard to their knowledge of *phenomena*, we shall find it consists not in an exacter knowledge of the efficient cause that produces them, for that can be no other than the *will of a spirit*, but only in a greater largeness of comprehension whereby analogies, harmonies, and agreements are discovered in the works of Nature, and the particular effects explained, that is, reduced to general rules (Principles, sec. 105).

I think that commentators usually involved in polemics of contemporary philosophy concerning the so-called direct realism tend to stress the anti-sceptical target of Berkeley's speculation, and to see to what extent Berkeley is sceptic or not sceptic, or defends or is against common sense. We should not forget that the other main target of Berkeley is atheism. Vision for Berkeley is

not simply like a language, but it really is a language: it implies the existence of a "speaker," God, since ideas do not depend for their production on us, as Berkeley makes clear in Dialogue IV of the Alciphron. What ultimately justifies the connection between the phenomena is the will of God. For Berkeley the way out of the scepticism of the senses is the same one that leads us to recognize the immediate providence of God who speaks to us in vision and produces in us ideas according to his will.

CHAPTER III

Porterfield's Criticism of Berkeley's Theory of Vision

1. Porterfield's Criticism of Berkeley: Ideas of Sight Do Not Suggest Ideas of Touch; Ideas of Touch Cannot Introduce the Ideas of Spatial Properties; Critique of Berkeley's Immaterialism.

Berkeley's theory of vision had a profound impact on the history of the psychology of vision. Nevertheless, what was most interesting in his theory from the philosophical point of view, its connection with immaterialism, has never been appreciated by writers on the psychology of vision, and was disparaged as belonging to the category of metaphysics in the nineteenth and twentieth centuries. While many authors commented upon Berkeley's theory in the eighteenth century, William Porterfield is of particular importance: he presented a theory of vision which rested on a completely different understanding of the nature of the relation of the perceptual world to the underlying material reality.

W. Porterfield was a physician and was mainly interested in explaining the physiology of vision in order to find a cure for diseases, such as crossed eyes. His physiology rests on a curious doctrine, according to which the mind has an unconscious influence on all the internal motions of the body. While he rejected many fundamental aspects of Berkeley's theory, he was also influenced by

that theory. Indeed, Porterfield was aware of Berkeley's criticism of the geometric theory of perception. The thought of Porterfield on vision had influence on the works of Thomas Reid, the originator of the Scottish school of common sense, and I will mention his views while discussing Porterfield's criticism of Berkeley.

In Porterfield's Treatise on the Eye (1759), we find some specific remarks concerning Berkeley's theory.¹ Porterfield gives a concise but clear account of Berkeley's theory of vision. According to Berkeley, the ideas of space, outness, distance, situation and magnitude of the things placed at distance cannot be introduced by sight alone into our minds. Having experience that certain ideas perceivable by touch are connected with certain ideas of sight, we are able to foresee what tangible ideas are likely to follow upon perceiving certain visible ideas. This is a "habitual or customary" connection between the two sorts of ideas similar to the relation in language between words and things signified by words. So, when we say that we see the magnitude and situation of a thing placed at distance, we just mean that our ideas of sight suggest to us that after passing a certain distance perceivable by touch, we will have certain tangible ideas usually connected with those visible ideas: "because there is no essential or necessary connection between the ideas of sight and touch, the ideas suggested by sight of the distance, situation, and magnitude of

¹ Porterfield first presented his ideas in "An Essay concerning the Motions of the Eyes," in Medical Essays And Observations of the Philosophical Society of Edinburgh, 2d edition (1737-38), vol. 3.

external things, must depend entirely on custom and experience" (TE, p. 305). One idea may suggest another to the mind just because they have been observed and experienced to go together without any demonstration of the necessity of their coexistence, "or without so much as knowing what it is that makes them so to coexist" (TE, p. 306).

Porterfield makes two remarks concerning Berkeley's theory. Firstly, he criticizes the notion of suggestion of one idea by the other. Berkeley seems to think that, upon perceiving a visible idea we recall a tangible idea "lodged in our memory" (TE, p. 306). According to Porterfield, nothing of this kind happens in vision. We do not recall tangible objects. This is a sort of phenomenological criticism of Berkeley. Porterfield argues that there is every difference between remembering an object we have touched and looking at an object presently before us. He notes that

When my eyes are shut, I can, at pleasure, recall to mind the ideas of touch, which former sensations had lodged in my memory; the bare naming the thing doth presently suggest them, as well as the seeing it. But there is nobody who doth not perceive the difference in himself between actually looking upon an object, and contemplating the idea he has of it in his memory; and therefore he has certain knowledge that they are not both memory or fancy (TE, p. 306).

It is difficult to determine whether this criticism is valid; it depends not only on an interpretation of Berkeley's theory but also on what we actually experience in vision.

The other criticism of Berkeley's theory of vision concerns its metaphysical background, immaterialism. Firstly, Porterfield notices that, on Berkeley's theory, the ideas of space, outness,

distance, magnitude and situation of things placed at distance cannot be introduced by the ideas of touch, because "the tangible ideas are as much present with the mind as the visible ideas, and, on that account, must be equally incapable of introducing the idea of anything external" (TE, p. 307). Here Porterfield seems to think that the perception of primary qualities must imply somehow the conception of their external existence in the sense of their independent existence from the mind, but this is exactly what Berkeley denies. The difficulty lies in the words "external", or "at a distance," as I explained in the second chapter. According to Berkeley to say that something is "at a distance" (or that it is "external", or "out," in an unphilosophical sense) means simply that after walking in a certain direction for a certain time, or after reaching out our arms, we will have a certain tangible idea. All this series of tangible ideas succeeding in time are suggested, as we said, by a certain visible appearance, just because of custom.

In any case, Porterfield rejects all the immaterialist reductionism of Berkeley's theory, as appears from the following passage.

How then can it be said that external distance and situation are only determined by the motion of body perceivable by touch? This is to destroy the universally received notion we have of things, and to confound external space, distance, and situation with a series of ideas succeeding one another in the mind. It is to take away all the difference between space and time, and to make both consist in a consciousness of a succession of different ideas or perceptions in the mind; whereas it is certain that neither of them depends on our ideas, but must continue the same whether we have any ideas or not. It is to introduce a wild and unbounded scepticism that

at once banishes this external world, and space itself out of the field of existence, and in place thereof substitutes a visionary world, a world of ideas and phantoms, existing nowhere but in his own mind (TE, p. 308).

It is to be noticed that this criticism is directed against an immaterialist interpretation of Berkeley's theory of vision.

In the second chapter, I showed that Berkeley's theory of vision, though formulated with materialist presuppositions, is compatible with immaterialism. I also tried to show that the main argument of the New Theory concerns the heterogeneity of the objects of sight and touch and their relation resulting from habitual association. The formation of the habit of association requires a certain regularity in the succession of objects of sight and touch in our experience. But this in turn only requires that the proper objects of sight and touch are perceived, not that they are either internal or external to the mind. Nevertheless, as I have shown, in his New Theory Berkeley presupposed that tangible objects are external to the mind. He implicitly accepted the assumption that the mind has a location in space and that objects are located at a distance from that location. If he had separated the problem of distance perception from the problem of independent existence, he could have considered the objects of sight and touch indifferently internal as well as external.

At first, Porterfield interprets Berkeley on the basis of the text of New Theory holding that tangible objects are independent of the mind. In his criticism, trying to attack the notion that tangible objects are external, Porterfield assumes that whatever is

immediately perceived is dependent on the mind. In this regard, he shares the ideas of many philosophers on the ontological status of what is immediately perceived. This is why he says that the ideas perceived by touch are present with the mind, and cannot introduce the idea of anything external.

Moreover, in all his discussion of vision, Porterfield adopts a meaning of "externality," which implies not simply independence from the mind, but distance in absolute space between the seat of the mind and the object perceived. According to Porterfield, ideas of touch cannot possibly give rise to any conception of externality and distance. Ideas of touch are always "here," close to the seat of mind, and, if we accept Berkeley's immaterialistic account, we reduce the ordinary notion of distance in space to a notion of 'distance' in time.

Porterfield holds that some ideas seem to exist independently of the mind.² However, this is possible only if there is a judgment at work in perception, whereby we judge our perceptions, which are internal to the mind, as external. This judgment is ascribed to what Porterfield calls an "innate law of vision" which is a central feature of his theory of visual perception. Since Porterfield accepts the premiss that the mind is situated in a certain place in

² Porterfield distinguishes three kinds of sensible qualities or ideas, on the basis of the intensity of their action on the mind: 1) strong perceptions, like pain and pleasure, which are always ascribed to the mind, 2) weak perceptions, like colors, smells, odours, which are ascribed erroneously to external objects, 3) moderate perceptions, like heat and cold, hot and humid, which are considered either external or internal (see "Essay," vol. 3, pp. 222-224).

absolute space, this law of vision is at the same time a description of the way we perceive distance and situation of objects outside by sight. The nature of this law of vision and its difference from the theory of "natural geometry" is the object of the following section.

2. Porterfield's Innate Law of Visual Perception of Situation and Distance.

In the first chapter I referred to Berkeley's solution to problem of situation perception, and particularly to the related problem of how we see an upright appearance by means of an inverted retinal image. Porterfield presents his solution to the problem of the inverted retinal image in the first chapter of Book V of his Treatise on the Eye. The solution to this problem depends on the adoption of what Porterfield considers a fundamental law of vision, which also allows him to solve the problem of single vision. According to this "natural law,"

Every point of an object appears and is seen without the eye, nearly in a straight line drawn perpendicularly to the retina at that point of it [retina] where its image falls (TE, p. 293, see p. 143 facsimile plate II, fig. 12).

According to Porterfield, this principle is "confirmed from the erect and natural appearance of objects tho' their image on the retina be inverted" (TE, p. 297). Indeed, applying this principle, a point, which is painted on either the upper or lower part of the retina, must appear in a straight line perpendicular to the retina

and so in the direction of the outward object whose position is opposite to the image painted on the fund of the eye. According to Porterfield, what has occasioned this difficulty concerning the upright appearance of objects is the supposition that the soul sees an image inverted on the retina.

The mind sees not any image on the retina, so it takes no notice of the internal posture of the retina, or of other parts of the eye, but uses them as an instrument only for the exercise of the faculty of seeing (TE, p. 298).

Porterfield explains that when the retina receives an "impulse" or "stroke" from the rays coming from the upper part of the object, the mind, without any regard to the situation of that part of the retina, is directed, according to the proposed principle, to consider the stroke as coming from the upper part of the external object, rather than from the lower part of the retina. Reid adopts the same law of visual perception in his Inquiry into the Human Mind, but he limits its role to the perception of situation. Porterfield, on the other hand, holds that this law allows us not only to perceive situation, but also to perceive distance by sight. Reid adopts the Berkleian explanation of distance in terms of habitual association of sight and touch.

Porterfield and Reid agree in adopting an innate "natural law" which is active in our visual perception. Both agree with Berkeley in denying that we see pictures on the retina. But both reject Berkeley's theory concerning the heterogeneity of the objects of sight and touch. Indeed, according to Berkeley, the appeal to heterogeneity was the way out of the paradox of the inverted retinal image. The visible objects are completely unlike the

tangible objects. Our immediate visible objects are not images on the retina, whose nature for Berkeley is purely tangible. So, in the visual perception of situation, we just learn to associate, by custom, visible objects and tangible objects which recur constantly together.

Porterfield and Reid would agree in denying that what we immediately see are images on the retina. Still, for them the images on the retina play a role in visual perception, as appears from their law of vision. In order to understand better the precise sense of this law of vision in these two authors, we must examine more in detail their particular conception of the relation between perceptual world and material reality in sense perception, and in particular in visual perception.

Porterfield first presents his law simply as a lemma. After discussing upright appearance as a way of illustrating his lemma, he adds a scholion in which he makes clear his thought:

The judgments we form of objects being placed without the eye in those perpendicular lines, or which is nearly the same thing, the judgments we form of the situation and distance of the visual objects, depend not on custom and experience but an original, connate and immutable law to which our minds have been subjected from the time they were at first united to our bodies (TE, p. 299).

The contrast drawn between this innate law and experience seems to show that this scholion is clearly directed against the theory of Berkeley.

Illustrating this scholion, Porterfield makes different remarks which illuminate the ontological background of his theory of perception.

It must be remembered that all our perceptions are present with the mind of which properly speaking they are only modifications, arising from the motions excited in the sensorium, and when we imagine that the colours we see are in the external object this certainly is not a perception, but a fallacious judgment or conclusion, whereby we attribute that which is truly present with our mind, and which our mind feels or perceives, to external objects (TE, p. 300).³

So, there are two aspects of Porterfield's law of visual perception of situation. The first aspect is what we can call "metaphysical delusion," the fact that we judge our perceptions, which are in the mind, to be external, independent of the mind. The second aspect is the specific modalities of realization of this judgment: "every point of an object appears and is seen without the eye, nearly in a straight line drawn perpendicularly to the retina at that point of it [the retina] where its image falls" (TE, p. 293). This sentence is ambiguous insofar as it does not clearly distinguish between the visible and the material object. We should say that we see the visible object (which is really in the mind) as if it were without the mind, nearly in a straight line drawn perpendicularly to the retina at that point of it where the image of the external object falls. We should also add that the image on the retina is material and not perceived. So, in vision we have a

³ In this passage Porterfield says that colours are seen as external. In his "Essay" he offers the same example, discussing the apparent external existence of perceptions (see "Essay," p. 224). Colours are the perceptions peculiar to sight and are in the mind. The mind has a location in absolute space. Consequently, when we say that colours are in the mind, we say that they are in the seat of the mind, the brain. The judgment at work in vision regards the "location" of colours. The original primary qualities that accompany colours before the judgment on their externality are the primary qualities of the place where the colours are, the "seat" of the mind.

kind of phenomenal, illusory space which is superimposed on the "real," material space. It is something analogous to the illusory space of the tangible perception of the phantom limb in the famous Cartesian example. So, this law of vision establishes the particular topological relation between the two spaces: in what direction of the "real" material space, visible direction appears. Still, to say that between the phenomenal space and the "real" space there is a topological relation is tantamount to saying that there is just one space where both the objects and perceptions are situated. Indeed, the mind is able to judge perceptions which are really where it is located (in the seat of the mind) as if they were at a distance, which is determined in relation to certain lines to be drawn between the objects and the eye. So it seems that the mind must finally be enabled by such law to displace its sensations in the outward space. This may be a problem for Porterfield's theory because it implies that the mind is located "here" (where perceptions are) and at the same time "there" (where perceptions are judged to be).⁴

Vision implies a judgment whereby our perceptions are judged to be external. Since, as I said, Porterfield thinks that the mind has a location in space, to judge that something is external to, or independent of the mind means to judge that something is at a

⁴ In this manner we can understand why Porterfield adopted the Cartesian metaphor of the blind man for illustrating his law of vision. In this famous Cartesian example there is an explicit reference to a "transfer of attention" of the mind from its seat to the external objects. See below, Appendix I.

distance from the seat of mind.

Moreover, as Porterfield remarks, "there is no essential or necessary connection between these perceptions and the judgments we form concerning them" (TE, p. 300). The judgment which is at work in the innate law of vision is not a geometrical deduction between whose premises and conclusion there is a necessary connection. In this regard, Porterfield seems to be aware of Berkeley's criticism of the theory of "natural geometry." In vision, there is not any calculation backwards of the path of the rays which affect the organs of vision. The connection between premises and conclusion is innate in the sense that is established by God, but does not imply any identity or transfer of essence between the two terms.

3. Porterfield's Criticism of Berkeley's Notion of Experience.

In this section we will examine why Porterfield contrasts his innate law of vision of situation and distance with Berkeley's account in terms of experience.

According to Porterfield, it is impossible that all our judgments of situation and distance depend on custom and experience, because it is impossible that we have some experience before we have some judgment, "which judgment must therefore depend on an original, connate, and immutable law, that cannot but obtain at least in some of our sensations" (TE, p. 300). He adds that "to say otherwise is to say something very absurd; it is to say we judge by experience that has never been experienced" (TE, p. 300).

This passage may at first seem very obscure, but from what he says in the following lines, we may try to understand it. If we say that the mind by custom and experience comes to conclude that what it sees is without the eye in those perpendicular lines, what do we mean by experience? It cannot be the experience of the sense of sight. Why, indeed, seeing an object a number of times should we conclude that it is external? The experience we refer to, is the experience of associating what we see with what we touch, or, as Porterfield says in a more concise expression, "the experience of the sense of touch." This implies that in the exercise of the sense of touch a judgment is supposed, which is not due to a customary association to another sense, but to an innate law. This means that by touch, in virtue of an innate law of our constitution, we form a judgment concerning our perceptions and conclude that they are not in the mind, but in something external. If this is true of touch, why should it not be true also of judgments we form of distance and situation by sight?

It cannot be said that it is more difficult for the mind to trace back the perceptions it has by sight from the sensorium to the retina, and from thence along those perpendicular lines to the object itself, than it is to trace back the perceptions it has by touch from the sensorium along the nerves to the external object occasioning them (TE, p. 301).

As I said, Porterfield accepts the Cartesian distinction of mind and body and the localization of the mind in the brain (or at least in the body). So the judgment (which is false in itself) concerning the externality of our perceptions, whether of touch or sight, implies at the same time a judgment concerning their

independent existence from our mind, and a judgment concerning their external location in relation to the "seat" of mind. Of course, Berkeley would not accept the claim that in touch there is a (false) judgment at work concerning the absolute independent existence of tangible objects. But I think that at least he should grant that there is a judgment at work concerning their relative independence, that is, their independence in relation to us, to our particular mind at this moment. This is the aspect of "common sense" that we have mentioned above in the second chapter.

We can draw some preliminary conclusions regarding Porterfield's theory of perception. Firstly, the perception of external objects implies a judgment. Our perceptions which are present with the mind are judged to be external. There is no "essential or necessary" connection between the premises and the conclusion of this judgment, as Porterfield says stressing the difference from the judgments we form in mathematical reasoning. So this judgment can be based only on experience, or on some innate law which connects premises (perceptions as objects in the mind) with conclusions (perceptions as qualities of external objects). If this judgment depends on experience, it must be the experience of another sense, which ultimately rests on a judgment which is based on an innate law. Secondly, this theory relies completely on what Reid calls the theory of ideas. Perceptions are present with the mind, and, as Porterfield will make clear later in his book, some of them (ideas of primary qualities) truly represent external objects, while others are completely unlike external objects (ideas

of secondary qualities). Hence the judgments we form concerning their external existence, although useful, are in themselves wrong.

4. Porterfield's Final Remarks on Berkeley's Notion of Experience.

Porterfield adds some further criticism of the notion of experience used by Berkeley, which makes clear that he misunderstands to a certain extent Berkeley's position on the foundation of experience. As we have seen, according to Porterfield's reasoning, if we say that our judgments of the situation and distance of the objects we see depend on experience, this must be the experience of the constant conjunction of what we see with what we touch. Hence, our judgments concerning the externality of what we touch must rest ultimately on an innate law. It follows that, according to Porterfield, a principle of uniformity and economy, which we must suppose in the works of nature or God, must lead us to think that the same process, an innate law, is originally present also in our sight. So the recourse to experience is useless.

But even if we admit that the mind in seeing is not subjected to an innate law, it does not follow that our judgments concerning the distance and situation of the objects we see depend only on experience. It is clear, as Porterfield says, that without the above mentioned law "a man born blind, being made to see, would at first have no idea of distance or situation by sight" (TE, p. 302).

How then is it possible that he may come afterwards to judge what he sees to be in the external object?

This cannot proceed from experience alone; for tho' by the touch we have frequently experienced the existence, distance, and situation of things external, and found these ideas to have been preceded by certain corresponding visible ideas, I see not how, upon perceiving any visible idea present with our mind, we should judge it to be without in the external object, without subjecting our mind to an arbitrary irresistible law directing it so to do. This were to establish an essential and necessary connection betwixt these judgments and the experiences we have by touch laid up in our memories: whereas, it is plain, no such thing can be; all the connection that is being only customary and experimental (TE, pp. 302-303).

This seems to be a radical criticism of the Berkleian notions of experience, custom, and habit. Porterfield seems to think that a connection between sight and touch would require at any rate a particular innate law, so that we may form our judgments concerning visible objects on the basis of our previous experience by touch. It is clear that habit, the simple "customary and experimental" connection of sight and touch is not enough to establish the connection on which our judgment rests. A law, a decree of God, is required. I do not know if Porterfield really understands Berkeley's notion of experience in this case. The customary association between sight and touch supposes a kind of regularity in the succession of visible and tangible ideas that is indeed established by God, and that can be rightly called a "decree of God." The habit that we form of expecting certain tangible ideas upon perceiving certain visible ideas has a solid basis in the coherency with which God communicates to us. This habit has a different status than some habits which are not founded in a

regularity established by God, for example the habit of associating dawn with cock-crow, or vespers with church bells.

However, Porterfield thinks that a principle of economy should lead us to suppose a law which implies a judgment of externality directly in vision.

And seeing nature, at any rate, must be at the charge of a law, is it not more reasonable to suppose that, by the sight alone, without any assistance from other senses, the mind in consequence of such a connate and immutable law, as has been allowed it in the judgments it forms by touch, should be enabled to trace back its own perceptions in the so often named perpendicular lines to the object itself, and thence to form a judgment of its distance and situation? I say, is not this more reasonable, than to suppose, that we stand in need of the experience of touch? Could these experiences be of any use without a new law, there might be some pretence for such a supposition; but this being impossible, it follows, that the judgments we form of the situation and distance of visual objects depend not on custom and experience, but on an original connate and immutable law to which our minds have been subjected from the time they were at first united to our bodies (TE, pp. 303-304).

To think otherwise is contrary to what we can call a principle of economy and uniformity in the works of nature: "It is to make nature do something in vain, and to be luxuriant in superfluous causes; which is to break down the catholic and fundamental rules of philosophizing, established by Newton in his Principia Philosophiae" (TE, p. 304).

Porterfield's theory does not represent an advancement in comparison with older pre-Berkleian theories, because it still requires that our ideas represent a mind-independent object. However, I think that it is important to notice that Porterfield is at least aware that the connection between ideas, conceived to be in the mind, and the false judgment that they are at distance does

not rest on a necessary connection which implies identity or similarity of essence, but on a decree established by God. In this way he seems to depart from the theory of "natural geometry," as criticized by Berkeley, which requires a deductive inference. He may have adopted this idea of natural law, as conjunction between nonsimilar terms, from Berkeley.

An important difference between the innate law of perception and natural geometry consists in the different role of the mind in the two theories. In natural geometry, as interpreted by Berkeley, there is a kind of unconscious geometric calculation from some elementary data of the situation and distance of objects, while, in this case, the mind is subjected to a law, an operative principle, which is not the same thing as a calculation backwards of the path of the rays of light. Nevertheless, as we shall see, it is also possible to speak of the mind as not simply being subjected to this law of vision, but as applying it.⁵

As I said, Reid adopts the same law, even if he limits its role to the perception of situation. Moreover Reid makes an extensive use of Berkeley's language metaphor in order to explain the relation between sensations, which are in the mind, and beliefs in an external world in his theory of perception. Reid adopts this metaphor because between sensation and belief, there is not any necessary connection implying an identity or similarity of essence between the two terms. He departs from Berkeley's position, because

⁵ See Appendix II.

he thinks that this relation is not learned. Beliefs follow sensations instantaneously, from the time of our birth.⁶

Porterfield and Reid are both realists, like the optical writers that Berkeley criticized. Still, they adopt a theory of perception which is based on an innate law, rather than the calculations of "natural geometry." In this manner they adopt one of the major tenets of Berkeley's theory: the connection between immediate and mediate objects in vision does not imply a calculation but a constant conjunction. They depart from Berkeley because they think that this connection is not learned through habit, but is an innate principle of our nature.

⁶ See Appendix III.

APPENDIX I

The Difference between "Natural Geometry" and Porterfield's Innate Law of Vision: Reid's Comments on the Blind Man Analogy

Porterfield introduces his law of vision of distance and situation in order to explain how we see an upright appearance by means of an inverted retinal image. According to the law of vision of situation and distance,

Every point of an object appears and is seen without the eye, nearly in a straight line drawn perpendicularly to the retina at that point of it [retina] where its image falls (TE, p. 293).

According to Porterfield, this principle is "confirmed from the erect and natural appearance of objects tho' their image on the retina be inverted" (TE, p. 297). Indeed, applying this principle, a point, which is painted on either the upper or lower part of the retina, must appear in a straight line perpendicular to the retina and so in the direction of the outward object whose position is opposite to the image painted on the fund of the eye. According to Porterfield, what has occasioned this difficulty concerning the upright appearance of objects is the supposition that the soul sees an image inverted on the retina.

The mind sees not any image on the retina, so it takes no notice of the internal posture of the retina, or of other parts of the eye, but uses them as an instrument only for the exercise of the faculty of seeing (TE, p. 298).

Porterfield explains that when the retina receives an "impulse" or "stroke" from the rays coming from the upper part of the object, the mind, without any regard to the situation of that

part of the retina, is directed, according to the proposed principle, to consider the stroke as coming from the upper part of the external object, rather than from the lower part of the retina. He refers to the famous Cartesian example of the blind man who, holding in his hands two sticks that cross each other, touches with them the extremities of an object placed in a perpendicular situation.

It is certain, this man will judge that to be the upper part of the object which he touches with the stick held in the undermost hand, and that to be the lower part of the object which he touches with the stick in his uppermost hand (TE, p. 299).

We can notice that T. Reid adopts the same law of vision in explaining situation perception, but at the same time he criticizes the Cartesian metaphor of the blind man, which Porterfield considers an illustration of this principle of vision. Reid considers this metaphor of the blind man in the same manner as Berkeley as an instance of the fallacious theory of natural geometry held by Descartes and other optic writers. Two features are wrong in Descartes' solution: firstly, he supposes that our seeing things upright by means of inverted images is a deduction of reason drawn from certain premises. Secondly, we are not acquainted with the premises of this reasoning, that is to say, we do not see pictures on the retina. So the metaphor of the blind man is misapplied in the case of upright appearances, because the blind man knows the position of his hands, knows that the sticks cross each other, and draws a particular conclusion from these data. Although he rejects the metaphor of the blind man and what he

thinks is its real interpretation, Reid adopts the same natural principle introduced by Porterfield (see *Inquiry*, pp. 156-163). He introduces only a slight technical change in the formulation of the law. According to Reid, "every point of the object is seen in the direction of a right line passing from the picture of that point on the retina, through the centre of the eye" (*Inquiry*, p. 157). These lines are almost, but not perfectly perpendicular to the retina, and this is the only technical correction of Porterfield's formulation.

Is Reid right in assimilating the metaphor of the blind man adopted by Porterfield to an example of natural geometry?

I want to suggest two differences between the blind man metaphor and natural geometry, however unimportant they might be. Firstly, there is some reason, in the sense of a necessary connection, in "tracing back" a stimulus from the brain to the retina, but there seems to be no necessary connection between the perceptions which are in our mind and the conclusion we draw that they are in the object. Here I use the expression "necessary connection" in the same sense as before, not just as a constant connection established by God (what Porterfield and Reid call a "natural law"), but a relation of the same kind we have in mathematical relations. Secondly, we must notice that the aforementioned law of visual perception, is not simply a geometrical reconstruction backwards of the path followed by the rays of light from the object to the retina. We see a determinate point of an object in a perpendicular line from the point of the

retina where its image falls. This perpendicular line coincides in its direction with the central ray among the many rays flowing from the corresponding point in the object, and refracted from the crystalline so that they meet in one point on the retina. But it is not necessary that the central ray should be present in order to see in those straight lines, as Porterfield and Reid show in an experiment where we see the head of a pin, through small lateral holes in a card which intercept the central ray. In short, according to this law we do not consider the actual path of rays in in the eye. The mind does not infer the situation of the external object following the path of rays backwards, as if it were observing what is happening in the eye, but immediately according to this natural law of vision.

APPENDIX II

Innate Law and Experience in Porterfield's Theory of Vision: The Solution to the Problem of Single Vision

In the third chapter we have seen Porterfield's criticism of Berkeley's notion of experience. It may seem strange that an author like Porterfield would be so opposed to the role of experience in perception. This is strange, particularly if we consider that his physiology is based on the idea that the soul has an influence on all the movements of the body. According to Porterfield, every physiological function is learned in childhood by a conscious effort. We find through trial and error the best way of working of our organs to our own advantage.¹ We can illustrate this theory of Porterfield by the metaphor of learning to use a mechanical instrument. At the beginning there is a conscious effort, but then the operation of using the instrument becomes effortless and customary. The operation of the soul always supposes a certain physical structure of our body which somehow determines the way we will make use of it. In short, we cannot use a hammer for the function of a car. In vision there is a sort of extension of this supposition of instruments which work in a certain way and are adapted to a certain use which we have to learn. There is a law of vision which is supposed and connects the visual world to the

¹ On Porterfield's theory on the relation between mind and body see John P. Wright, "Metaphysics and Physiology: Mind, Body, and the Animal Economy in Eighteenth-Century Scotland" in Studies in the Philosophy of the Scottish Enlightenment, edited by M. A. Stewart (Oxford: Clarendon Press, 1990), pp. 265-275.

physical world. But the mind must in any case learn to make use of this law, when first it is united to the body.

This appears if we consider Porterfield's solution to the problems of single and double vision. Indeed, the law of vision above mentioned, is applied primarily to explain how we see objects single, although we have two eyes. According to this law, objects are seen without the eye, in lines drawn perpendicularly to the retina, at that point of it where their image falls. So the object will be seen in the direction of two lines, drawn from the two retinas, which intersect each other. Since the mind also has a power of judging rightly of the distance of the object, it follows that the object will be seen by both eyes at the precise point where the two lines intersect "and consequently must appear single, because we can have no idea of the penetration of matter, or, which is the same thing, it is impossible for us to conceive two visible objects placed in the same place at the same time" (TE, pp. 309-310). It is important to notice the these right lines in which the object is seen, continue to be the same, "without any change of situation, though the eye be turned away from the object to which the other eye is directed" (TE, p. 311). This means that single vision, according to Porterfield, is not due to the parallel motion of the eyes. We learn to move our eyes parallel, or, as it would be more precise to say, to direct their axis to the same point, because in this way our vision of objects is clearer: the point to which both our eyes are directed is projected on the central part of the retina which is more sensitive. But this does not prevent a

cross-eyed person to see objects single. Single vision is due to the law of vision mentioned above. Although the same point of an object projects an image on the retina in two non-corresponding points of the two retinas of the cross-eyed, the object is always seen at the concourse of those lines which are perpendicular to the retinas.

A person who, by an accident (paralysis of the muscles, etc.) has lost the parallel motion of the eyes, at first sees things double and only gradually acquires the ability of the person who has always been cross-eyed to see objects single. In this case, according to Porterfield, "the mind mistakes the situation of the eye, and supposes that is directed to the same object with the other" (TE, p. 310). I will quote entirely the long explanation given by Porterfield of this "mistake" of the mind, not only because of its clarity, but also on account of the fact that the writings of Porterfield are not available in any current edition.

To illustrate this matter, let it be supposed, that one wills both eyes to be directed to F, (see still fig. 12, plate II, p. 143) for viewing it accurately, and that while the left-eye gives ready obedience, let the other, by reason of a recent defect in some of its muscles, be turned to H. It is plain, that the point F will be seen in the same perpendicular line CF it would have appeared in had the eye been directed to F. But, because this line, by reason of the obliquity of the eye does not fall on the retina at its axis C, but at some other point on the outside of this axis, as E, so that the angle CoE may be equal to the angle FoH; it will appear translated to EG; and being thus translated, the point F must be translated with it, which therefore will be seen, not in its proper place F, but in some other place, as G, situated in the perpendicular EoG; for since the mind knows not but the eye is directed to F, it must form the same judgment with respect to the situation of objects, as if it were really so; but it has been already shown that objects are always seen by virtue of a connate

immutable law in lines drawn perpendicularly to the retina, from that point of it where their image falls; and therefore the object F, having its image painted on the retina at E, must be seen by this eye, which the mind supposes directed to F, somewhere in the perpendicular EG, as at G, while with the other eye it appears in its true place F; and being thus seen in two different places G and F, it must necessarily appear double (TE, pp. 313-314).

From this passage we can see that, according to Porterfield's theory, the mind in applying the law of vision supposes always a certain disposition of the eyes. Once this familiar disposition is altered, it takes some time before the mind becomes aware of the new disposition of the eyes. So, for the purpose of a good vision, the mind learns gradually to apply the law to the right situation of the parts of our body.

APPENDIX III

Reid's Theory of Visual Perception

T. Reid in his Inquiry into the Human Mind adopts the same law discovered by Porterfield in order to explain the visual perception of situation. Still, the metaphysical framework of his theory of vision is completely different. According to T. Reid, the conception that our ideas or sensations, which are present to the mind, are copies of qualities of the external objects has ultimately led to doubting the reliability of our senses. Descartes, Malebranche, and Locke distinguished between ideas that resemble qualities of objects and ideas that, although occasioned by qualities in the external objects, are nevertheless completely different from them. Berkeley showed that the ideas of primary qualities are present with the mind in the same manner as the ideas of secondary qualities, and there is no means to discriminate among them. The supposition of an insentient external world is unjustified, if we attend solely to our ideas, and recognize that they cannot exist without being perceived.

What Locke had proved with regard to the sensation we have by smell, taste, and hearing, Bishop Berkeley proved no less unanswerably with regard to all our other sensations; to wit, that none of them can in the least resemble the qualities of a lifeless and insentient being, such as matter is conceived to be (Inquiry, p. 142).

Finally, the scepticism concerning the external world has led to the speculation of Hume who even denies the reality of a permanent subject of ideas, the soul.

The progeny that followed, is still more frightful; so that is surprising, that one can be found who had the courage to act the midwife, to rear it up, and to usher it into the world. No causes nor effects; no substances, material or spiritual; no evidence, even in mathematical demonstration; no liberty nor active power; nothing existing in nature, but impressions and ideas following each other, without time, place, or subject (*Inquiry*, p. 142).

Reid thinks that we conceive and believe in the existence of an insentient external world because of a principle of our nature which leads us to that irresistible conception and belief. The perception of the external world is a process in which different steps follow each other, according to the will of God. These different steps do not show any resemblance or necessary connection among them. When we say that they constitute a law of nature, we mean only that their conjunction is constant. The external objects cause material impressions on our sense organs, directly by application, or indirectly by means of a medium. These material impressions cause movements of some sort in the nerves and in the brain, although Reid acknowledges that scientists know almost nothing about the structure of the nervous system at the time he is writing.

From the succession of events on the physical level of external objects and our body with its sense organs and brain, a sensation arises which is in the mind and completely different in its nature from matter. So Reid accepts completely a dualistic conception of mind-body relation: the mind and its sensations are completely unlike bodies and matter. Accordingly, there is no extension, space, magnitude, figure, motion, solidity, and gravity

in our minds. The sensation of sound is completely unlike the sound in the external world, the vibration of air caused by bodies.

It deserves to be remarked, that, in the analysis we have hitherto given of the operations of the five senses, and of the qualities of bodies discovered by them, no instance hath occurred, either of any sensation which resembles any quality of body, or of any quality of body whose image or resemblance is conveyed to the mind by means of the senses (Inquiry, p. 140).

The sensations give rise, in any case, to a conception and belief of an external cause. For example, on hearing a sound, I have a sensation in the mind, but also a conception and belief of something external that causes that sensation, although I have no clear conception of what this external cause is. The sensations corresponding to secondary qualities (smell, taste, heat and cold, colour) give rise only to a conception and belief of an unknown external cause. There are sensations, on the contrary, that although completely different in their own nature from the external cause, give rise to a clear conception of the external world as it is in its primary qualities, along with the belief in its existence. The sensation we have by touch of hardness or softness is followed by a conception and belief concerning hardness and softness in the body, that is, a conception and belief concerning the cohesion of parts of a body. Again, it is important to notice that the sensation of hardness or softness in itself has no property in common to that conception of a body to which it is connected. Hence the causal connection between material impression and sensation, and between sensation and conception and belief of an external cause, is just a constant conjunction, without any

identity or transfer of essence implied in it (what we usually think is going on in a necessary connection). The relation between sensation and the conception and belief of qualities of a body is best exemplified by the relation between signs and things signified in language.

We are inspired with sensations, and we are inspired with the corresponding perceptions, by means unknown. And, because the mind passes immediately from the sensation to that conception and belief of the object which we have in perception, in the same manner as it passes from signs to the things signified by them, we have, therefore, called our sensations signs of external objects; finding no word more proper to express the function which nature has assigned them in perception, and the relation they bear to the corresponding objects (*Inquiry*, p. 188).

It is evident that Reid adopts the metaphor of language from Berkeley's writings. Still, in Berkeley's theory, the signs, the visual ideas, refer to other ideas, the tangible ideas. For Reid the signs, the sensations, refer to the conception and belief of an external world. Moreover, there is an important difference between Berkeley and Reid. In Berkeley's theory the relation between sign and signifier must be learned through habit, although the formation of habit supposes a certain regularity in the succession of ideas of sight and touch. In Reid's theory the connection between sign and signifier in perception is operative because God has decreed that a certain conception and belief will follow a certain sensation. In this relation between sign and signifier there is no necessary connection in the sense that there is not any identity or similarity of essence between the two terms. But this connection does not require experience to be learned, and this feature makes Reid's view of the conceptions and beliefs in external reality

reminiscent of the theory of innate ideas, as Hume noticed.¹

Reid explains in detail the mechanism of suggestion of secondary and primary qualities by means of non-resembling sensations. By hearing, smelling, and tasting we have sensations that suggest the existence of an external cause, but we do not have any clear conception of what that cause is. On the contrary, by touch we have a clear conception of the qualities of the body which occasions the sensation. The process of perception in vision is more complicated. What we find after the events on the physical level is a sensation, corresponding to a secondary quality: that is, a quality we have no clear conception of, even if we know that it must be external (and consequently extended, but how we cannot tell). This quality is colour, and I take occasion here to remember that, according to Reid, names such as colour, hardness and softness, heat and cold, etc. must always be ascribed to the quality in the external body (whether after the sensation we have a clear conception of the quality or not) and never to the sensation it occasions. Along with the sensation corresponding to colour, we have a clear conception of a two-dimensional surface, what Reid calls, a visible appearance.

When I see an object, the appearance which the colour of it makes, may be called the sensation, which suggests to me some external thing as its cause; but it suggests likewise the individual direction and position of this cause with regard to the eye. I know it is precisely in such a direction, and in no other. At the same time, I am not conscious of anything that can be called sensation, but the sensation of colour. The position of the coloured

¹ See John P. Wright, "Hume vs. Reid on Ideas: The New Hume Letter," in *Mind*, 96 (1987), 392-398.

thing is no sensation; but it is by the laws of my constitution presented to the mind along with the colour, without any additional sensation (Inquiry, p. 145).

What colour is in itself, as a property of bodies reflecting light, we cannot tell on the basis of the sensation of colour. The visible appearance of a two-dimensional surface which usually follows this sensation only informs us of the direction of the body endowed with such a property. Why in vision, along with the sensation and consequent perception of an unknown secondary quality, there is a perception also of the direction in which this quality is situated is something we cannot explain. Reid also says that it would be possible, without any contradiction, to imagine sight as furnishing only the sensation of colour, without any information on direction (as it happens actually when the colour, because of a cataract is diffused all over the retina), and on the contrary to imagine smell or hearing as furnishing, along with the sensation of the secondary quality, some immediate information of the direction of the external object. So, it seems not precise to say that the sensation of colour suggests, occasions, or is a sign of the appearance of a two-dimensional surface, although in our actual vision the sensation of colour always accompanies this appearance. What the sensation of colour suggests is just colour. We should say that this visible appearance of a two-dimensional surface arises immediately from the impression on the sense organs of sight, without being suggested or occasioned, as it happens with touch, by a corresponding sensation (qualities such as hardness and roughness are suggested by a sensation). It would be possible to

conceive a pure vision, without the sensation of colour, although this never happened.

Now, this material impression, made upon a particular point of the retina, by the laws of our constitution suggests two things to the mind--namely, the colour and the position of some external object. [...] Since there is no connection between these two things suggested by this material impression, it might, if it had so pleased our Creator, have suggested one of them, without the other (Inquiry, p. 146).

This visible appearance, with its primary qualities, is believed to be external--how could it be otherwise?--at no distance from us, attached to our eyes, as the boy who recovered vision reported to Dr. Cheselden (see Inquiry, p. 136). Moreover, this visible appearance has a striking resemblance with the image on the retina. Indeed most of its properties are just like those of the image on the retina (as a difference, we may notice that usually we have two eyes and so two images on the retina, but just one visible appearance). Reid even notices that it is not a plain surface, but a curved surface, and so he devotes a section to the construction of a new "geometry of visibles." Nevertheless, he is explicit in saying that this visible appearance, external or conceived and believed to be external (the ambiguity is in Reid), is not the image on the retina: "We have reasons to believe that the rays of light make some impression upon the retina; but we are not conscious of this impression" (Inquiry, p. 146). Against this background, the law of the perception of situation connects the material impression (the image on the retina) with the visible appearance. In particular, the position of the material impression on the retina (which is inverted) is connected to a position of the

visible appearance (external or conceived and believed to be external).

The visible appearance, as we said, is two-dimensional and even if it is not the image on the retina, reproduces many, if not all, of the features of the projection of the three dimensional external world on the curved surface of the retina. So, the difference between extension, as apprehended immediately by sight, and as apprehended by touch, is in the number of dimensions we know immediately by the two senses. Consequently, by sight, in its immediate apprehension, the objects appear two-dimensional, and their figure and magnitude vary according to their distance and situation. So, Reid denies the thesis of a complete heterogeneity between sight and touch: the extension we know by sight is two-dimensional, but is still extension. Moreover, there is a connection between the objects of sight and touch that is due to the fact that the material object is one although it affects the senses in a different manner. The same laws of perception assure us of that identity. For example, by the law of the perception of situation we see objects immediately in the same direction as they appear to the sense of touch. So, certain features of the objects of touch are known immediately by sight: their number (thanks to the law of single vision), and their situation. Other properties of the objects of touch are known by sight only indirectly, by experience: distance, magnitude, figure. In this case, we learn to interpret the visible appearance as a sign of the extension known by touch. So in vision we have the singular case of an external

object (the visible appearance) which works as a sign for another external object.

APPENDIX IV

Porterfield's Theory of Visual Perception of Distance and Magnitude: The Role of Experience

I would like to add some further reflection on Porterfield's understanding of visual perception of magnitude and distance. We have quoted before many passages where Porterfield says that the perception of situation and distance depends not on custom and experience but on an innate original law. Indeed often I spoke of this law as the law of perception of situation and distance. In Porterfield's Treatise, Book V, we find also a chapter devoted to perception of distance. Here Porterfield distinguishes six means, whereby we are able to perceive distance by sight. Reid remarks in his Inquiry that "in the enumeration of these, we agree with Dr. Porterfield, notwithstanding that distance from the eye, in his opinion, is perceived originally, but, in our opinion, by experience only" (Inquiry, p. 189). Reid may have been induced to interpret in this way Porterfield's thought, because indeed Porterfield in the previous chapter about single vision speaks about distance as being perceived originally. But if we examine the way the six means of perceiving distance are introduced, a different interpretation may appear. The first means to perceive distance is the contraction of the ligamentum ciliare, which changes the conformation of the crystalline, allowing us to see objects which are near distinctly. This contraction of the

ligamentum ciliare "being sensible to us, because it depends upon our mind which regulates it, will enable us in some measure to judge of distances, even with one eye" (TE, pp. 386-387). This change in the conformation of the eye has its limits (from seven to twenty seven inches, according to Porterfield), so that outside these limits the indistinct appearance of the object supplies the place of the contraction of the ligamentum ciliare in order to esteem distance. The first problem which arises from this account is to explain how two elements (contraction of the ligamentum ciliare, and confusion) suggest to us distance without being sensations which are associated by experience with distance as known directly in some other way (by touch). Indeed this last explanation is adopted by Reid and Berkeley, but the text of Porterfield is not clear.

The second means is the inclination of the optic axes. Here Porterfield speaks of the eyes as being "two different stations in longimetry, by the assistance of which distances are taken" (p. 388). Is this a calculation, like in the usual account of natural geometry?

The third means is the apparent magnitude of the image on the retina. But this means depends obviously on our being acquainted before with the real magnitude of the object: "as often as we are ignorant of the real magnitude of bodies, we can never from their apparent magnitude, or the magnitude of their image on the retina, form any judgment of their distance" (TE, p. 395). So, the adoption of this means requires experience.

The fourth means to judge of distance "is the force wherewith their colour acts upon our eyes" (TE, p. 396). Here, Porterfield mentions explicitly experience:

If we are assured that two objects are of a similar and like colour, and that one appears more bright and lively than the other, we judge, by experience, that the object that appears most bright, is nearer than the other (TE, pp. 396-397).

The fifth means consists in the different appearance of the small parts of the objects at different distances: "when these parts appear distinct, we judge that the object is near, but when they appear confused, or when they do not at all appear, we judge that it is at a greater distance" (TE, p. 396). Again this judgment seems to be possible only on the basis of our experience of an association between these appearances and distance.

The sixth means consists in the interposition of objects between the eye and the object whose distance we judge. Here, as every author admits, experience is at the basis of our judgment. This means provides also Reid and Porterfield with the solution of the problem of the larger appearance of the moon on the horizon. The interposition of objects on the horizon makes the moon appears more distant than when it is high in the sky, and consequently larger. Indeed, both Porterfield and Reid agree in making the perception by sight of the magnitude of external objects depend on our previous acquaintance with their distance. This is different from Berkeley's approach to the perception of magnitude. For Berkeley, a certain visible cue (faintness of visible appearance) suggests magnitude, by way of the experienced association between

this visible cue and the real magnitude as perceived by touch. So, in the perception of magnitude we do not take into account distance. For Porterfield and Reid, the estimate of magnitude of the external object depends on the magnitude of the visible appearance, which depends on the magnitude of the image on the retina, and on our knowledge of the distance of the object.

It is in relation to the perception of magnitude that Porterfield speaks of natural geometry. He makes a list of different geometrical methods to know real magnitude, once we know the dimension of the image on the retina and the distance of the object. He concludes that "by such methods as these, our mind is enabled to exercise its natural geometry in judging of the magnitude of objects" (TE, p. 380). In the same chapter, Porterfield explains at length that we have no idea of magnitude in itself but only in relation to our body, and he indeed speaks of the infinite worlds containing each other of Locke's and Malebranche's discussion on the subject. He also says at some point that the picture on the retina is "sensible to us" (TE, p. 375). In the previous chapter on the perception of colour we find other hints of some difficulty in defining the direct object of the mind. I will quote just this passage as an example:

It is not that external sun or moon which is in the heavens, which our mind perceives, but only their image or representation impressed upon the sensorium. How the soul of a seeing man sees these images, or how it receives those ideas from such agitations in the sensorium I know not; but sure I am, it can never perceive the external bodies themselves, to which it is not present (TE, pp. 357).

In this passage, Porterfield seems to think that the immediate object of sight is the "image or representation impressed upon the sensorium." This ambiguity of Porterfield in the definition of the immediate object of vision is caused by his acceptance of the principle that the mind has a location in space. So, perception is explained on the analogy of the physical relation of contact, or impulse between two objects, in this case the sensorium and the mind which is inside the sensorium.

Apart from the brief mention of "natural geometry" in relation to the problem of visual perception of magnitude, these parts of Porterfield's work reveal his debt to Berkeley's explication of visual perception in terms of experience.

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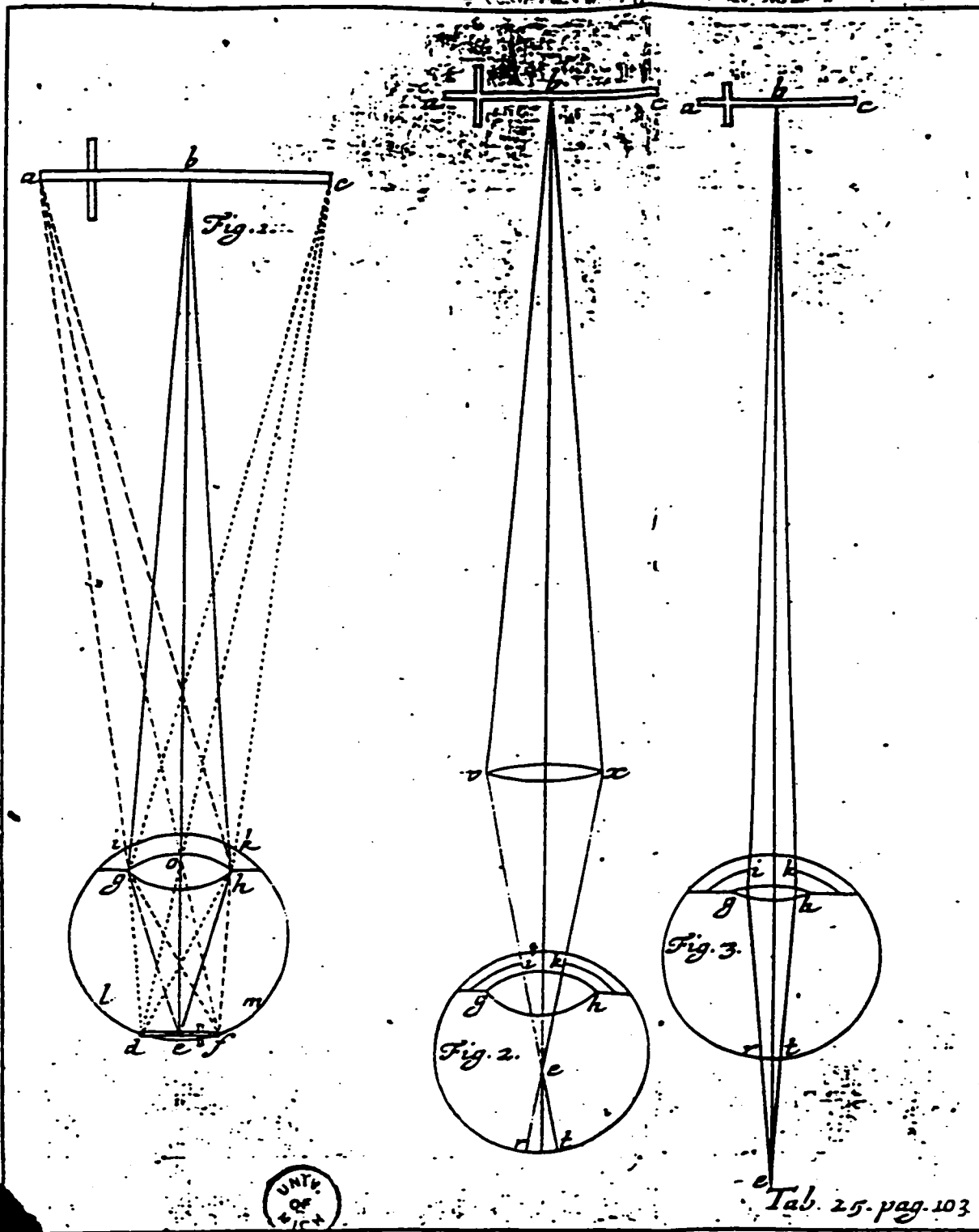
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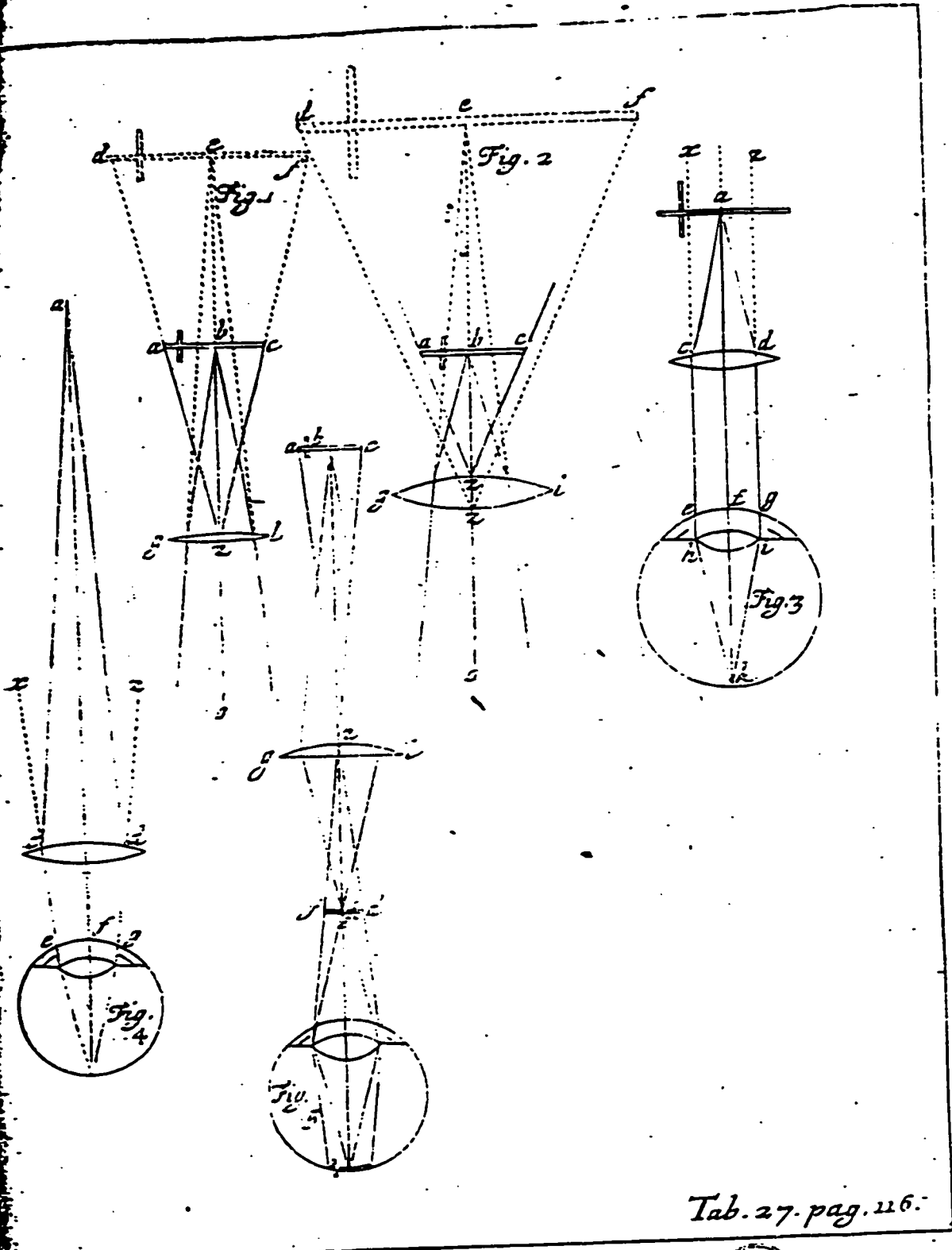
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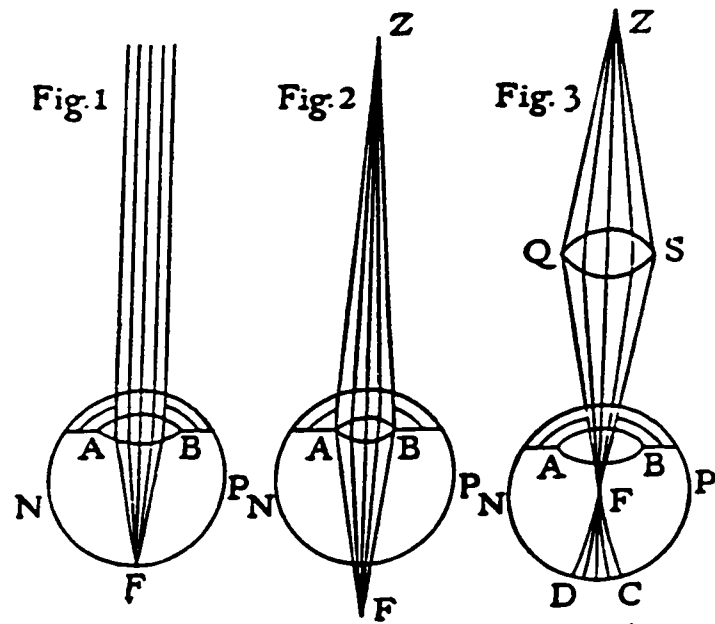
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VOL. II. PLATE II.

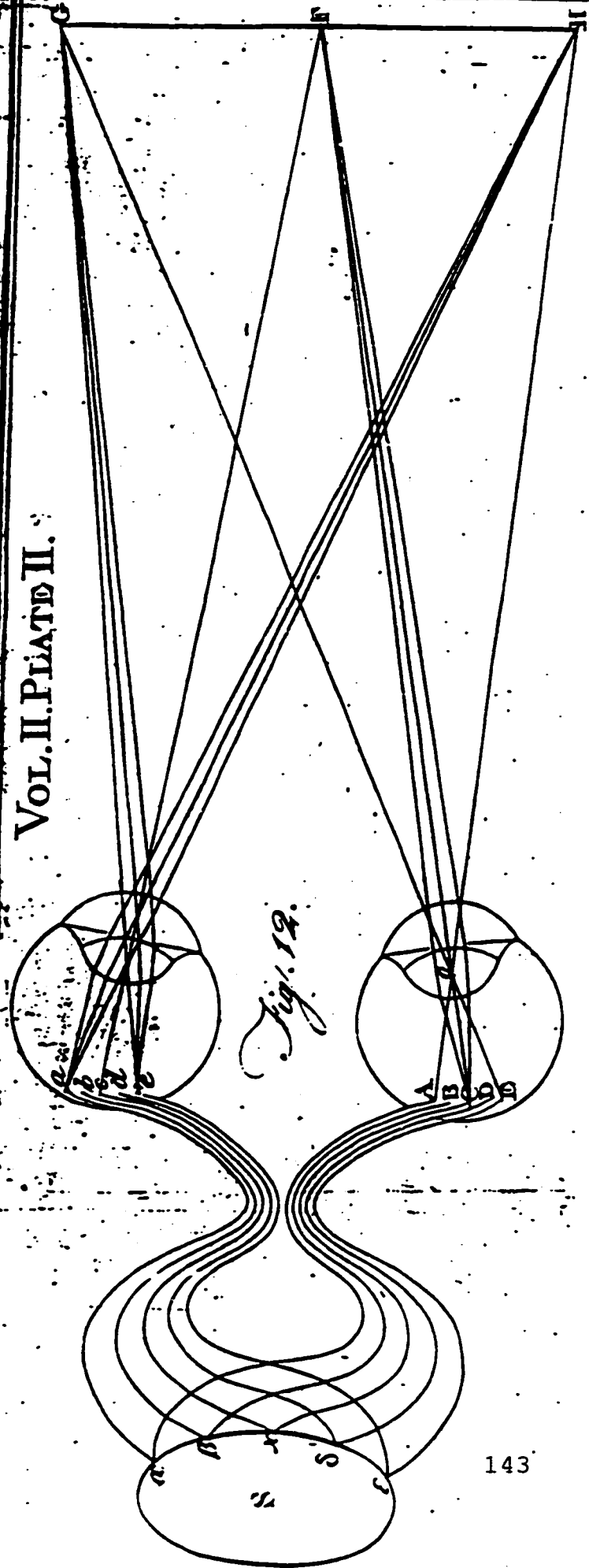
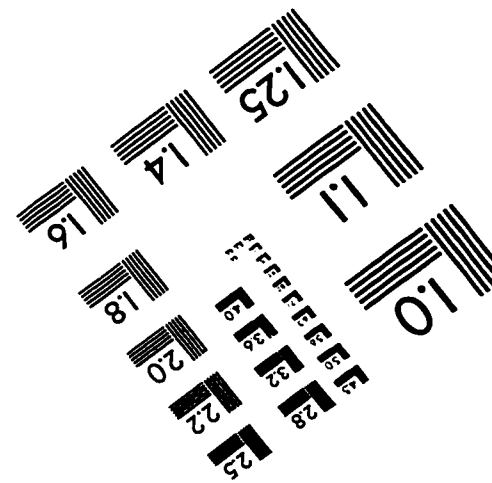
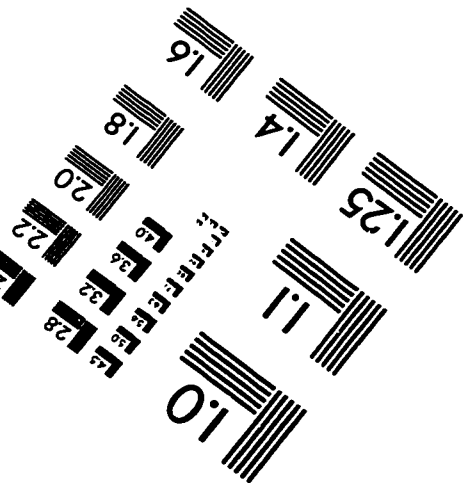
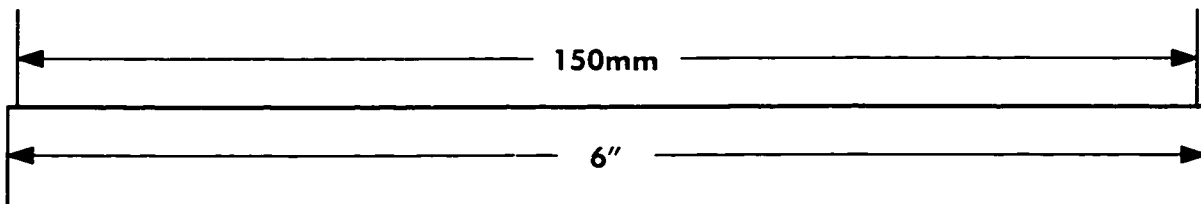
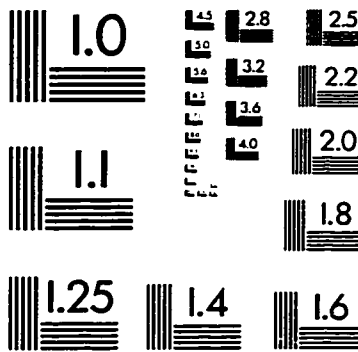
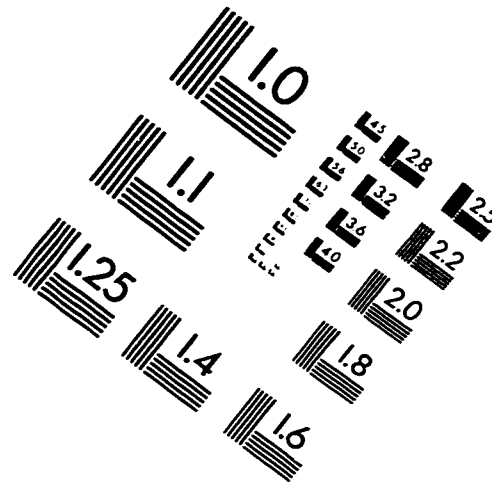
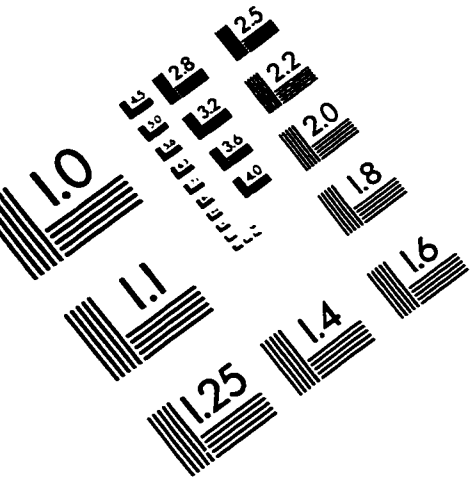


Fig. 12.

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