Perception, Content and Action

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To my sister

(hoping she'll reconsider her decision to become a surgeon)

Resumen:

La teoría dual de sistemas visuales, tal como es defendida por Andy Clark, David Milner y Alvin Goodale cuenta con grandes ventajas en la explicación de los procesos computacionales requeridos para la experiencia perceptual y el control visual de la actividad motora. Sin embargo, el planteamiento de la teoría por parte de éstos autores conduce a una noción de la acción intencional según la cual ésta se encuentra disociada en dos elementos: un proceso de nivel personal, que involucra la toma de decisiones en términos de tipos de acciones y objetos sobre los cuales ejercer la acción; y un proceso de nivel subpersonal, que involucra la ejecución de rutinas motoras. Esta caracterización de la acción intencional es problemática en tanto que, al situar la realización física de la acción en el nivel subpersonal, no puede dar cuenta del compromiso epistémico involucrado en la interacción corporal del sujeto con su entorno. Tampoco puede dar cuenta de las relaciones normativas que hay entre la estructura del entorno, la estructura de la actividad y la intención que guía dicha actividad. Defenderé la tesis de que la evidencia que motiva la teoría dual de sistemas visuales puede sustentar una interpretación diferente, que admita una visión de la acción como un fenómeno unitario y plenamente normativo. Dicha interpretación debe darse en términos de los tipos de normatividades que caracterizan los contenidos mentales proporcionados por cada una de las corrientes, y no ya en términos de procesos personales y subpersonales.

Palabras Clave: Percepción, actividad motora, normatividad, contenido, nivel personal de explicación, nivel subpersonal de explicación, compromiso epistémico, responsabilidad.

Abstract:

The dual visual streams hypothesis, as it is defended by Andy Clark, David Milner and Alvin Goodale constitutes a very good explanation of the computational processes required for perceptual experience and the visual control of motor activity. However, the theory leads to a view according to which intentional action is dissociated in two separate elements: a personal level process, which involves the formation of intentions in terms of action-types and target-objects; and a subpersonal process that involves the execution of sensorimotor routines. This view is problematic insofar as it situates the execution of actions at a subpersonal level and therefore it cannot account for the epistemic commitment that is involved in the bodily interaction between a subject and her environment, or the normative relations between the structure of the environment, the structure of

motor activity and the intentions that guide it. I will defend the thesis that the empirical evidence that supports the hypothesis can also support a different interpretation that admits a view of action as a unitary phenomenon that is entirely normative. Such interpretation should be given in terms of the different kinds of normativities that characterize the perceptual contents processed by each of the visual streams.

Key words: Perception, motor activity, normativity, content, personal level of explanation, subpersonal level of explanation, epistemic commitment, normativity.

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Introduction

This thesis is an exercise in the conceptual analysis of one of the most controversial, and yet most explanatory, hypotheses in contemporary sciences of vision: Alvin Goodale and David Milner's Dual Visual Stream Hypothesis. This hypothesis is developed as an attempt to explain the functional significance of the separation of visual brain processing in two independent streams. Several hypotheses about a dual function in vision were advanced in the past century. Milner and Goodale's reinterprets the functional division in terms of a specialization oriented to two kinds of motor outputs. One of the streams processes information in the format required to form a visual representation of the world, which makes possible the intelligent selection of actions. The other is in charge of the processing of visual information oriented to visuomotor control. The proposal, in other words, claims that one stream is in charge of vision for perception and the other is in charge of vision for action. This view of the functional division constitutes a philosophical thesis of great import.

Milner and Goodale's hypothesis plays a central role in the contemporary philosophical debate concerning the content of perceptual experience and its relation to motor activity. The debate between conceptualist theories of perception and those defending the existence of a non-conceptual content is one of the central debates in contemporary philosophy. On one extreme there are theories such as McDowell's (1994a) that argue for a conceptualist view of the contents of experience, appealing to the role they play in the justification of empirical knowledge. On the other extreme, there are theories that defend that the content of experience must be non-conceptual, such as Evans' (1982), Cussins' (2003) and Peacocke's (1998; 2001). Amongst these theories, some claim that the content of experience is (at least partly) determined by its role in the control and guidance of motor action. The debate between these theories is framed by two fundamental questions that I will address throughout the thesis: (1) Are the contents of experience conceptual or non-conceptual?; (2) What is the relation between the content of experience and motor action?

Milner and Goodale's empirical hypothesis, and all the evidence presented in its favor, have a direct relevance to this debate. The theory comprises a view of the contents of experience that goes hand in hand with a view of intentional action, both of which are germane to the questions involved in the debate. Andy Clark (2001) argues that this theory presents evidence against philosophical views that claim that there is a direct link between experience and motor control, and in favor of views

claiming that the content of experience has a conceptual (or concept-ready) nature. If Milner and Goodale's theory and the empirical evidence they present were taken at face value, the debate would be resolved in favor of the views that deny a direct link between experience and motor action.

The idea that I will develop in this work is that, even though the hypothesis is an excellent physiological and functional explanation of the division of labor in the visual system, it is not a good philosophical theory about the relation between perception and action. Extending a functional division of brain processes to the personal level, as a division at the level of perceptual experience and intentional action, brings about grave conceptual problems that I will expose. Insofar as the theory is supposed to play an important role in the resolution of a philosophical debate, as Clark pretends, these problems should be carefully considered as a factor in the assessment of the theory and, especially, the reach of its philosophical implications.

Following the line traced by these initial objections, I will sketch a model for a theory of the relation between perception and action. The model sketches a view of action that has implications for theories of the content of perception. I will attempt to show that perception has a normative relation to motor action that consists in serving as a guide for the execution of bodily movements that are attuned to the environment. I will claim that, in order to fulfill this role, perceptual experience must have non-conceptual contents that are directly involved in the guidance of motor activity. Furthermore, I will argue that this philosophical claim is not incompatible with the current empirical evidence.

This dissertation deals with an empirical hypothesis and attempts to undermine it through conceptual considerations. One of the most important questions about this research concerns its relevance: why is conceptual analysis important for an empirical theory? As I will attempt to show throughout this work, the theory I will be examining has a great deal of philosophical content, not only because of its implications, but also because some of its assumptions have a highly philosophical nature. The terms in which the debate is formulated and the general framework in which it is presented also involve philosophical concepts and theses. For this reason I will address a hybrid version of the hypothesis, situated in between the empirical and the philosophical. This runs the risk of over interpreting Milner and Goodale's view. However, this version can arguably be found in Andy Clark's philosophical interpretation, and in an analysis of the concepts and

assumptions behind the formulation of the theory. Strictly speaking, the target of my objections will be the philosophical elements in the theory. I will question some presuppositions and object to some consequences of the theory. I will also analyze the way in which these philosophical components interact with the empirical elements of the theory.

The philosophical concepts and background assumptions of the theory allowed me to select a philosophical framework for its interpretation and assessment. The framework I take is that of theories of the content of experience with a neo-Fregean and normativistic tendency. Such choice is justified both by the kind of concepts employed by the authors in the formulation and defense of their hypothesis, and by the fact that its philosophical consequences are clearly situated in such framework.

The defense of this thesis has a limited scope and will be done within the framework of some, perhaps problematic, assumptions. One of them is that perceptual experience has contents. I will not engage in a debate with views that hold that experience is to be understood as a direct relation with objects (i.e. without contents), like Campbell's, Martin's or Brewer's; nor with views that reject that experience plays a justificatory role in judgments, like Davidson's. The debate with these positions will be postponed for another occasion.

In general terms, this work attempts to show that the philosophical consequences that Andy Clark draws from Milner and Goodale's view, and its supposed impact on the debate about perceptual experience, are unsound. Within the framework in which the debate is situated, Milner and Goodale's theory leads to conceptual problems. It will be shown that, in this conceptual framework, the theory cannot appropriately account for the relation between perception and action. This dissertation can be seen as a case study of a more general problem: the influence of philosophical concepts and assumptions in the formulation of empirical theories, and vice versa. It attempts to explore in depth the consequences of the interdisciplinary dialogue established by Milner and Goodale's theory.

Chapter 1
The Dual Visual Streams Hypothesis

The dual visual streams hypothesis is a model for the functional interpretation of the physiological division of visual processing in the human and primate brain. Visual information passes by the retina, through the geniculostriate stream, to the primary visual cortex (V1). From this point two streams emerge: one that carries visual information to the inferior temporal cortex, and one that carries information to the posterior parietal cortex. The former is known as the *ventral stream* and the latter, as the *dorsal stream*. Researchers on vision agree that there is a physiological division and that its has important functional implications. Each stream has characteristic modes of information processing, and it is known that each one is adapted to codify certain properties of the visual field. There is, however, some disagreement regarding the precise nature of the functional division.

There have been diverse theories about a functional division in the brain systems that support visual coding. Trevarthen (1968) was the first to postulate two distinct functions for vision. He named one of them “ambient vision” and the other, “focal vision”. The former served the purpose of providing guidance for movements of the entire body, such as locomotion and posture adjustment. The latter served the purpose of guiding fine motor control.

Schneider (1969) proposed a distinction between a subcortical and a cortical stream. The former used the projections from the retina to the superior colliculus in order to localize objects in the visual field. The latter was the geniculostriate stream, which enabled the identification of objects. This hypothesis is known as the division between the “what” and “where” systems. Ungerleider and Mishkin (1982) adopted this approach to the functional division, but proposed a different neurological implementation. According to their view both streams are cortical. The function of identification was associated to what we currently know as the *ventral stream* and the function localization was associated to the *dorsal stream*. Livingston and Hubel (1988) adopted a similar view, adding an association between the dorsal and ventral streams and the mango and parvo-cellular streams.

Trevarthen draws the functional division as responding to the different kinds of conduct to which vision contributes. Ungerleider and Mishkin draw the division in terms of the different visual

properties that are codified by each stream. The latter distinction is drawn in terms of visual inputs, whereas the former is drawn in terms of the distinct behavioral outputs that are served by visual processing. This difference in the portrayal of the division involves suppositions about the function of vision and, more generally, about the reason for the modularization of cognitive functions. As will be clear in the following section, these suppositions have important consequences on the way in which hypothesis are formulated, and may even lead to important philosophical consequences.

1.1 Milner and Goodale's bold proposal

Milner and Goodale (1995; 2004) advance a hypothesis that starts from the idea that the primary function of vision is the distal control of motor outputs (1995: 7, 18) Vision emerges in the evolution of vertebrates as a mechanism for the control of action. For this reason, if there are two streams for visual processing, their apparition must have responded to selective pressures on action itself. Consequently the explanation of the functional division should start from the motor outputs for which the different kinds of visual processing are destined.

Milner and Goodale's hypothesis, which Andy Clark (2009) calls their "bold proposal", is that the division between ventral and dorsal streams should be understood as a division between vision for perception and vision for action. One of the motivations for this proposal is the idea that the computational requirements for these functions are radically different. In order to obtain a visual representation of the world, visual information must be codified in a characteristic way, very different from the way in which it must be codified to appropriately guide motor control.

According to their model, the ventral stream codifies visual information in a manner appropriate for the construction of a visual representation of the world, whose contents are objects, events, properties and relations. The type of visual processing that goes on in the ventral stream is what allows subjects to carry out perceptual tasks, such as object discrimination, recognition and categorization. In order to accomplish these tasks, the ventral stream must create representations of particular objects, which in turn requires it to compute perceptual constancies, in an allocentric coordinate system, with relative metrics, and that it does so by working in close connection with short and long term memory (Milner and Goodale 1995: 2, 20). Lets call this set of computational requirements for perception, Set P.

On the other hand, the dorsal stream codifies visual information for the purpose of fine motor control; that is, for the fulfillment of motor tasks such as navigation, grasping objects, catching them in the air, etc. These tasks require that the brain has access to constantly updated information about the position of objects relative to the subject's body and their real size, in order to be able to act upon them. For these tasks, the dorsal stream codifies spatial properties in an egocentric coordinate system (moreover, in several effector-specific coordinate systems) and it computes an absolute metric for objects (Milner and Goodale 2004: 75-6). From now on I will refer to these requirements for motor control as Set M.

The functional division thus stated intends to be consistent with engineering principles. This view is consistent with, and possibly motivated by, the idea that natural selection of brain systems for vision obeys to selection pressures on the motor outputs of such systems. Starting from the premise that there are two types of tasks (perceptual and visuomotor), and showing that each of them requires a particular type of codification, it seems to follow naturally that those tasks are carried out by two independent systems.

> [W]e propose that the anatomical distinction between the ventral and dorsal streams corresponds to the distinction we made earlier between perceptual representation and visuomotor control. In other words, the reason there are two cortical pathways is that each must transform incoming visual information for different purposes (Milner and Goodale 1995: 24)
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> This division of labor must have emerged in our primate ancestors because of the different processing demands imposed by these two functions of vision (Milner and Goodale 2004: 73)

It may seem paradoxical to assert that vision is a mechanism for the control of action and then characterize one of the streams of visual processing as "vision for perception". However, these ideas do not conflict in Milner and Goodale's theory. Codification in the ventral stream is as oriented towards action as codification in the dorsal stream, though in a very different way. Ventral processing subserves the intelligent and flexible selection of action types and target objects[1].

In Milner and Goodale's 1995 and 2004 books, there is an implicit inference to the best explanation, which runs as follows:

[1] See: Chapter 2

(1) There are two kinds of tasks, perceptual and motor, for each of which there is a set of computational requirements: respectively, Set P and Set M

(2) Set P and Set M impose incompatible and interfering tasks for a system of visual coding.

(3) If incompatible and interfering tasks are carried out by a single system, it will not function properly and effectively.

(4) Evolution favors the division of labor in order that tasks are carried out effectively.

(5) The human visual system performs effectively and successfully for both perceptual and visuomotor tasks (i.e. typically there is no interference between tasks)

(6) ∴ The coding of visual information for perceptual tasks functions independently of the coding for visuomotor tasks.

The argument is supposed to substantiate Milner and Goodale's bold claim. However, the claim is stronger than the conclusion yielded by the argument. Their hypothesis is that information used for motor control is not only useless for the performance of perceptual tasks, but it is inaccessible to the subject's visual experience.

> The visual information used by the dorsal stream for programming and on-line control, according to the model, is not perceptual in nature. According to our definitions, therefore, it cannot be accessed consciously, even in principle. In other words, although we may be conscious of the actions we perform, the visual information used to program and control those actions can never be experienced (Milner and Goodale 2008: 776).

According to the quote, the visual information used for motor control cannot, *in principle*, be part of experience. From this statement it may be inferred that the information that constitutes the content of visual perception can never be used for the purpose of motor control. If information used in motor control is not perceptual in nature, it may be said that perceptual information is not visuomotor in nature and thus cannot be accessed by the processes that guide motor control; i.e. the fact that certain information is part of perceptual experience implies that it does not play a role in motor control.

Thus, Milner and Goodale's argument is supposed to yield the stronger conclusion:

(7) ∴ The contents of visual perception are not accessible for processes of visuomotor control, and the information used for visuomotor control is not accessible to the subject's perceptual experience

The argumentative step from (6) to (7) doesn't seem to be entirely legitimate. It involves an unjustified transition between two levels of description. (6) is a thesis about the independence of brain processes that are necessary for the fulfillment of certain tasks. (7) is a thesis about the separation between perception and motor action, which are personal level phenomena.[2] Furthermore, going from (6) to (7) implies a transition form a factual statement about the independence of two brain systems, to a statement about the inaccessibility *in principle* of certain information to personal-level perceptual experience. (7) is not a thesis about neural modularity, nor about informational encapsulation of brain processes. Milner and Goodale actually maintain that there are neural connections and information exchange between both streams (1995: 204). Rather, (7) states that the contents[3] of visual experience are inaccessible in principle to the processes of visuomotor control, and vice versa.

The transition from (6) to (7) can be seen as one of several interpretative steps that take place in Milner and Goodale's formulation of their hypothesis. The first step is one that goes from the anatomical to the functional level; that is, from the level of brain structures, to the level of computational requirements and tasks. All of the evidence that Milner and Goodale bring forth, as well as the argument above (1-6), give strong theoretical and empirical support to this inference. The transition from (6) to (7) involves a further step, from the computational to the personal level of explanation[4]. Milner and Goodale seem to suppose that the support for the first transition is, so to speak, inherited by the second transition. This supposition is warranted, only if the theory presupposes a certain conception of perceptual experience, which I will refer to as the narrow view of experience, and which I will explain in the following sections of this chapter. I will argue that this view of experience also permeates their interpretation of empirical evidence.

Because of the transition from (6) to (7) Milner and Goodale's hypothesis about a neurophysiological division turns out to be a highly counterintuitive philosophical thesis. The

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[2] In Milner and Goodale's texts there seem to be several unjustified transitions between levels of explanation. They move from talking about information processing in the brain to talk about perception and action, and vice versa.

[3] It may seem tendentious and illegitimate to talk about *contents*, when I've been talking about *information.* I use term to refer to the visual information that is part of the subject's perceptual experience. Its use is not tendentious (at least for my part) insofar as Milner and Goodale define perception as a representation of the environment. I will assume that it is legitimate to talk about the *contents of perception* when perception is understood as a representation. In the following section (1.2) I will analyze the notion of perceptual experience that is used by Milner and Goodale.

[4] For an explanation of the way in which the notion of "personal-level" will be used in this thesis, see Chapter 2.

stronger conclusion (7) plays a central role in the current philosophical debate about perceptual experience. The main exponent of the philosophical importance of Milner and Goodale's hypothesis is Andy Clark. In his 2001 article, "Visual Experience and Motor Action", Clark argues that the hypothesis contradicts an intuitive view of perceptual experience that is central in the contemporary debate about the non-conceptual content of experience. Clark refers to this view as the *assumption of experience based control* (EBC)

> Assumption of Experience-Based Control (EBC): Conscious visual experience presents the world to the subject in a richly textured way, a way that presents fine detail (detail that may, perhaps, exceed our conceptual or propositional grasp) and that is, in virtue of this richness, especially apt for, and typically utilized in, the control and guidance of fine-tuned, real-world activity. (Clark 2001: 496)

EBC is the assumption according to which the contents of experience provide a basis for the control of motor activity. According to Clark's formulation it is the richness and fineness of detail of experience that make it apt for the guidance of motor activity.[5]

Clark argues that the empirical evidence that supports the dual visual stream hypothesis goes against EBC, insofar as it shows that motor control is independent from, and inaccessible to, visual experience. The systems for visuomotor control do not use visual information that is part of the subject's experience, hence experience plays no role in the guidance of motor activity.

Insofar as empirical evidence refutes EBC, it also refutes the theories of non-conceptual content that seek to establish a direct link between experience and motor activity. According to Clark, Milner and Goodale's empirical proposal supports either the philosophical theories that hold that perceptual content is conceptual (Clark 2001: 514), or the theories that commit to non-conceptual content but establish an indirect link between such content and motor action (Clark 2001: 515).[6] For this reason Milner and Goodale's hypothesis is germane to the philosophical debate concerning perceptual experience and should be carefully examined.

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[5] Throughout the thesis I will use this concept (*motor activity*) to refer to a subject's bodily movements in an environment. Motor activity is not the same as intentional action. It is the way in which the body moves in, and interacts with, its environment, either for the fulfillment of an intention or in a non-intentional way. I will explain this point in length in Chapter 3 (Section 3.2)

[6] For an exhaustive presentation and analysis of Clark's argument, see Chapter 4.

The transition from (6) to (7) doesn't seem to be entirely legitimate. If it is granted that there is a conceptual problem in this transition, and that a further argument is needed for its justification, then Clark's philosophical interpretation also requires a thorough conceptual examination.

The argument described above is not the only support for Milner and Goodale's bold proposal. Their theory not only "makes excellent computational sense" (Clark 2001: 501), but it puts forward a wide variety of empirical evidence. This evidence is what justifies, for Milner and Goodale, the transition from (6) to (7). As I will argue, the justification for this transition depends on the implicit assumption of a particular conception of perceptual experience that is pervasive in Milner and Goodale's work. On the light of this conception, the empirical evidence has only one possible explanation: Milner and Goodale's hypothesis. I will argue that if this conception is cast aside, or simply bracketed, there are at least two possible interpretations for the evidence, one of which doesn't lead to Milner and Goodale's hypothesis, nor to the denial of EBC.

In this chapter I will show that Milner and Goodale's model is based on the implicit acceptance of a particular definition for the theoretical term: *perceptual experience*. I will exhibit the crucial role that this term plays in the formulation of the model. In the following chapters I will reject the meaning that is given to this term, based on the conceptual problems that it entails. I will also show that it is possible to propose a different model for the interpretation of empirical evidence.

1.2 The narrow view of experience

In the Introduction to *The Visual Brain in Action* (1995), Milner and Goodale characterize perception as "subserving recognition and identification of objects and events, and their spatial and temporal relations" (1995: 2). Perception, they claim, excludes reflexive phenomena (as the control of pupillary diameter) and the processing of visual information used for the online control of skillful action, such as walking or grasping objects (1995: 2). According to their model, the function of visual perception is to construct a perceptual representation of the environment, which allows for flexibility and intelligence in the control of action. This is accomplished by means of object categorization, abstraction from particular points of view, the processing of perceptual invariances and the independence between particular visual inputs and motor outputs. They claim that ventral processing:

> subserves an intermediate goal in the guidance of behavior, specifically the formation of perceptual representations of objects and of their relationships. Such representations are necessary if behavior is to be guided intelligently by events that have occurred at an earlier time, allowing, for example, a mate or a prey object to be categorized correctly and, thus, acted upon appropriately. This use of vision in the categorization and recognition of objects must rely on stored information that can be abstracted from particular viewpoints or contexts in which the object might be seen. Furthermore, to permit maximum flexibility this system must be free from rigid linkage to particular possible responses, though the system would be essential for the selection of goals and the selection of actions relating to those goals. This perceptual system would by its nature have to be independent of particular motor outputs. (Milner and Goodale 1995: 20)

Thus, from the outset, a certain view about visual experience can be discerned. In the first place, visual experience is a representation of the world, hence it has some kind of content. This representation is used for the purposes of recognition, identification and categorization of objects. In order to fulfill this functions, visual experience requires the processing of perceptual constancies and invariant features. We can say, therefore, that the contents of visual experience are particular objects, and their relationships, with invariable properties, which are prone to categorization and recognition.

This characterization is further developed with their definition of perceptual tasks: those tasks by means of which it can be determined whether a certain visual stimulus is part of a subject's conscious experience. Perceptual tasks are performed by means of perceptual reports. The criterion for the fixation of a certain content in a subject's conscious experience is the (potential) reportability of the content (Milner and Goodale 2008: 775).[7] In other words, the accessibility of a certain stimulus to the subject's experience is determined by the possibility to report the stimulus. Verbal reports are the most common case of a perceptual task: subjects make verbal assertions based on their experience. There are also non-verbal reports that can be conveyed by manual gestures (such as pointing in the direction of a stimulus, indicating the orientation of a slot with the orientation of the hand, or indicating the size of an object with the tips of the fingers). These tasks involve bodily movements, but they are distinguished from visuomotor tasks in that they respond to verbally formulated questions, while visuomotor tasks consist of object oriented actions. Manual reports are acts of communication:

[7] This criterion is standard and uncontroversial in the field of psychophysics and experimental psychology. However, my argument intends to cast doubt on its use for the purpose of drawing philosophical conclusions regarding the nature of perceptual experience.

> It is the purpose of the movement that matters. When we asked people to use their hand to show us what they saw in the matching test, they were reporting on their conscious perception of the slot in front of them. Turning the hand in this case was an act of communication. The fact that the communication happened to be manual was arbitrary —the same information could have been conveyed by a variety of different means. They could have drawn a line on a piece of paper, for example; or picked the correct orientation from a number of alternatives in a multiple choice test; or of course they could simply have told us in words. (Milner and Goodale 2004: 28-9)

According to this definition of perceptual tasks, every report is an act of communication. In these reports, subjects assert something about their experience. Acts of assertion have been traditionally regarded as expressions of judgments. This view of assertion can be traced back to Frege's "On sense and Reference" (1948) and "The Thought" (1956). Thus, a perceptual report is the expression of a perceptual judgment. In order to report a stimulus, the subject must perform a judgment based on the contents of her experience, which will be the content of her assertion.[8]

In accordance with this Fregean view, if the criterion for attributing contents to a subject's perceptual experience is the reportability of the content, it follows that a necessary condition for such attribution is that the content is liable to form part of a perceptual judgment. That is, if the information that counts as an experience is just the information that the subject can report (at least in principle), then for information to be considered a content of experience it must be apt for articulation in a judgment. Information that cannot enter a perceptual judgment is information that the subject cannot report in principle, not even potentially; hence it will not be considered a content of the subject's conscious experience.

These features of Milner and Goodale's view of experience make it very similar to philosophical theories that maintain that the content of experience is conceptual or concept-ready. In order to be liable to categorization and to become a part of a judgment, the contents of experience must be

[8] There is a potential objection to this point of my argument, regarding the relevance of a Fregean analysis of an empirical criterion. In a purely empirical theory, the philosophical implications of experimental models may be entirely irrelevant. However, the theory I am analyzing involves both empirical and philosophical theses and has important philosophical consequences, that I have presented in the first section of this chapter. Moreover, the philosophical implications that Clark draws from Milner and Goodale's hypothesis have a direct impact on theories of perception that are situated in a Fregean framework: Evans', Cussins', McDowell's and Peacocke's. In other words, the philosophical debate that this hypothesis raises is framed by the presuppositions and concepts of a neo-Fregean approach to philosophy of mind and language. The impact of the hypothesis on these theories should be assessed in a manner that is consistent with the philosophical framework where they are situated.

either conceptual or concept-ready.[9] Categorization is the subsumption of something under a certain category. This can be a process of conceptualization. If a subject sees an object as a laptop, in virtue of its properties of shape, size, and color, the process of categorization consists in subsuming the object under the category "laptop". She may be said to see the object as falling within the extension of the concept "x is a laptop".[10]

On the other hand, judgments have been traditionally regarded as propositions that are endorsed as true (Frege 1948; 1956). Propositions, in turn, are composed of concepts. Therefore, if a specific content is apt to be part of a judgment, it must be either conceptual or concept-ready (that is, subsumable under concepts).[11] Following this line of thought, if the only criterion available for attributing contents to a subject's experience is that the content can be reported, then the contents of a subject's perception are only those that she can report, at least in principle. Since perceptual reports are expressions of judgments, it can be said that a necessary condition for a certain stimulus or information to count as part of the subject's experience is that such information is prone to be articulated in judgment and reported. In order to be available for an articulation in judgment, contents must be conceptual, or concept-ready.

This understanding of perceptual experience is what I will call *the narrow view of experience*. This view restricts the contents of experience to those that are prone to be articulated in judgments. According to this view, if a certain stimulus or information is not available to be articulated in a

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[9] The notion of concept-readiness (as I will use it throughout the thesis) is taken from McDowell (1994a). He claims that, even if the contents of our experience may not be already conceptualized --in the sense that subjects have at their disposal the relevant concepts under which the content can be subsumed-- they are all concept-ready, or conceptualizable, insofar as they can always be captured by means of demonstrative concepts (See: McDowell 1994a: Chapter 3). This point is fundamental to support the idea that every perceptual report involves a judgment. This idea could be refuted by saying that non-verbal perceptual reports do not involve judgments, since subjects don't possess the necessary concepts to subsume the contents of experience. To this objection, it may be replied that the report of the orientation of a line by means of a hand gesture consists in the expression of a judgment involving a demonstrative concept. What makes the report the expression of a judgment is its purpose in the context of a perceptual task: to answer a propositionally formulated question.

[10] Strictly speaking, categorization cannot be equated with conceptualization. The reason is that there may be processes of categorization in non-conceptual animals. Animals may see some object as food or as a predator, thereby categorizing the object, and yet they cannot be said to be in possession of the concepts "food" or "predator" (not in any of the senses in which it is said of a human being to possess a concept). I will not touch the issue of how animals may categorize without concepts, but rather I'll restrict my argument to human perception. I'll say that, in Milner and Goodale's theory, the categorizability of contents does amount to concept-readiness. The reason is that, besides being prone to categorization, these contents must be available for reports.

[11] There are passages where Clark uses the notion of "non-conceptual judgements", or judgements that do not involve the use of concepts (2007: 586). In the Fregean framework where Clark places this debate, judgements are considered to be conceptual exercises par excellence, which is why the notion seems to be out of place. On the other hand, the notion of a judgement that doesn't involve conceptual abilities is simply obscure. If this notion is to be taken seriously in the current debate, its soundness would be Clark's burden of proof.

judgment, and reported, then such a stimulus is not considered part of the subject's perceptual experience. As I will argue below, Milner and Goodale's conception of experience plays a central role in the way in which they present and interpret empirical evidence.

1.3 Empirical evidence for the dual visual streams hypothesis

One of the virtues of Milner and Goodale's hypothesis is the great variety of empirical evidence that supports it. In this section I will present some of the most relevant cases and experiments that they present. I will describe only the cases that most clearly support their conclusion. The rest of the experiments are variations of these, which do not alter the results of my analysis in a relevant way. I leave it to the reader to verify whether this is so.

The evidence for the hypothesis can be divided in three groups. The first group contains evidence from neurophysiological studies carried out on primates and humans, by means of functional imagery of the brain. This group will be excluded from my exposition, since I have no interest in debating the thesis on this level of explanation. In what follows I will take for granted: (1) that there are two streams of processing for visual information; (2) that this separation has functional implications that can be discerned in neurophysiological studies, as well as in psychological studies. What I intend to discuss is Milner and Goodale's philosophical interpretation of this functional division (7). For this purpose I will discuss the evidence from the second and third groups, in which the link to the philosophical thesis is manifest.

The evidence in groups two and three consists in a set of experiments that seek to display a double dissociation between perceptual and visuomotor tasks. The second group includes experiments carried out on people suffering from different brain pathologies. It includes three types of pathologies: optic ataxia, visual form agnosia and blindsight. The third contains experiments carried out on healthy subjects, which, like the others, display a double dissociation between the two functions of the visual system.

1.3.1 Dissociation in pathological cases

This group contains the most prominent source of evidence for Milner and Goodale's hypothesis. The pathological cases clearly exhibit a double dissociation between perceptual and visuomotor

tasks, which Milner and Goodale take as a dissociation between the contents of experience and the information that guides visuomotor control. I'll present and analyze the cases to show that this interpretation is permeated by the narrow view of experience.

A. Optic Ataxia

Brain lesions in cortical areas that belong to the dorsal stream (particularly the parietal lobe) cause a more or less uniform set of symptoms that has been interpreted in diverse ways. The first authors who described the syndrome were G. Holmes (1918) and R. Bálint (1909). Whereas Holmes described the syndrome as a deficit in visuospatial functions (or "disorientation"), Bálint described it as a deficit in visuomotor functions (or "optic ataxia"). One of Milner and Goodale's central claims is that the correct interpretation of the syndrome is the latter: lesions in the parietal lobe cause deficits in visuomotor processing (1995: 119)[12]. In this section I will describe some of the symptoms caused by lesions in the parietal lobe that impair the ability to grasp objects.

Before describing the symptoms it is necessary to describe the dynamics of reaching-and-grasping hand movements in unimpaired subjects. Jeannerod (1988) refers to the two components of these movements as *transport* and *grasp.* The former consists in the transportation of the hand in the direction of the object, until it reaches the point where it is located. The latter includes the prehension movements of the hand and fingers. When healthy subjects reach their hand to grasp an object, their hand begins to open (i.e. the grasping movements start their course) almost at the same time that the hand begins to move towards the object. Approximately at 2/3 of the transport movement, the hand reaches its maximum grip aperture (MGA). The aperture of the hand is directly proportional to the size of the object, even though it is larger than the object. From the point in which the hand reaches its MGA it begins to close until it reaches the object. Success in this action requires, among other things, that the transport movements are accurately directed to the position of the object; that the hand aperture is adequate to the size of the object; that the contact with the object is made with the tips of the fingers and that these are positioned on certain points of the

[12] The hypothesis that Milner and Goodale defend throughout their book is presented as an alternative to Mishkin and Ungerleider's (1982) view of the two visual streams as the "what" and "where" systems. Part of their defense consists in showing that the processing of information in the dorsal stream is implicated in visuomotor functions, rather than visuospatial functions. This claim is substantiated by the fact that lesions in the structures of the dorsal stream cause visuomotor deficits. According to Milner and Goodale, the processing of spatial information occurs in both streams. Each of them codifies space in a characteristic way that is appropriate for the kind of motor output that each stream subserves (1995: 119). In this text I will assume that the evidence favors Milner and Goodale's view, and I won't discuss the visuospatial nature of dorsal processing. For a detailed discussion, see: Milner and Goodale 1995: Chapter 4; Jacob and Jeannerod 2003: Chapter 3

object's surface, so that it won't slip. All these elements constitute what Milner and Goodale describe as "a beautifully orchestrated action" (2004: 22).

Observations of patients who suffer Bálint-Holmes syndrome show that lesions in the parietal cortex disrupt performance in the various grasping movements described above. In the first place, these patients cannot direct their hands accurately to the position of the object (Tzavaras and Masure 1976). Secondly, the patients are incapable of rotating their hands in a manner appropriate for the action they are performing (for example, to introduce it into a slot). Third, their hands move towards the object completely open, with the palm facing down and the fingers close together. There is no anticipatory adjustment of the hand aperture that adjusts to the object's size. In some cases the contact with the object is made by the palm instead of the tips of the fingers (Jeannerod 1988). Other subjects are unable to position their fingers on the opposing points of the object that allow for a firm grip, so when they grasp objects with smooth surfaces they slip and fall, unless the subject corrects the position of the fingers using tactile information. In a few words: "the well-regulated patterns of movement that typify the normal person's reaching and grasping behavior were severely disrupted in patients with optic ataxia" (Milner and Goodale 2004: 34).

Despite this inability to convert visual information into bodily movements, that are adjusted to the properties of objects, these patients have no difficulty in the performance of perceptual tasks. They are able to categorize, identify, and distinguish objects, compare them on the base of their size and shape, etc. They can correctly describe and indicate with their hand the orientation of a slot, but they are unable to introduce their hand inside it (Perenin and Vighetto 1988). They are able to accurately estimate the size of objects but cannot adjust their hands to grasp it. Apparently, these subjects' visual experience remains intact, but it is useless for the visual control of bodily movements.

> To borrow some terminology from robotic engineering, optic ataxia can be seen as a disruption of the control systems connecting the sensors (dealing with the input) and the actuators (providing the output). These control systems would take all the relevant optical information from the sensors and re-code it for the programming and control of the goal-directed movements of the robot. In the human brain, analogous systems have to transform visual information about the size, shape, orientation, motion, and spatial location of the goal object, into a code for programming and controlling the person's skilled motor acts. (Milner and Goodale 2004: 37)

The quote suggests that optic ataxia is not a deficit in the patients' visual representation of the world. Optic ataxia consists, rather, in a deficit in the connexion between visual inputs and motor outputs: in the use of visual information for the programming of bodily movements. This deficit is caused by lesions in structures of the dorsal stream. On the other hand, their accurate perceptual reports indicate that patients with optic ataxia possess an accurate visual representation of their environment that allows them to issue true judgments about the different properties of the objects they see. This is explained by the fact that they have no brain damage on the structures of the ventral stream. Milner and Goodale infer that these patients' visual experience remains intact.

I'll briefly describe some experiments performed with two of the reported patients. AT (Anne Thiérry) suffered a bilateral occipito-parietal stroke (Jacob and Jeannerod 2003: 92). She had no difficulty in naming, describing and recognizing objects and visual forms. With a hidden hand, she was able to accurately estimate the sizes of objects, having the same performance than healthy subjects. However, when her ability to grasp these same objects was tested, the results were quite different. She could not calibrate her hand aperture to the size of the object, but made an exaggerated aperture, which she did not close as the hand moved towards the object. Hence, the contact with the object was made with the palm of her hand or the proximal phalanxes. This resulted in awkward grasps, or on her being unable to grasp the object, since she pushed it with the palm of her hand (Jacob and Jeannerod 2003; Milner and Goodale 1995; 2004)

RV (Ruth Vickers) suffered a bilateral parietal lesion caused by two strokes --each in one of the hemispheres. Just like AT, RV's lesion didn't seem to affect her visual representation of the world. She had a normal performance in perceptual tasks, and could even copy line drawings (though she did it clumsily because of her lack of motor abilities). Goodale et.al. (1994) tested her ability to grasp objects, with an experiment known as the "Blake Forms". This experiment was initially devised to test the effectiveness of grasping in robots. RV was presented with some flat pebbles, with a smooth texture and abstract shapes. The first task consisted in comparing the shapes of several pebbles to determine whether they were the same, or different. RV had a normal performance in this task. The second task consisted in grasping the pebbles with the tips of her fingers. The shape and texture of the objects were specifically designed so that it was possible to have a stable grasp only when the tips of the fingers were positioned on the opposite points of the object. Otherwise, they would slip and fall. RV showed an inability to grasp the objects correctly. She would pose her fingers on random points of the objects thereby generating unstable grips. Due

to their smooth textures they fell from her hand, unless she corrected the position using tactile information.

These experiments show that there is a high degree of independence between perceptual and visuomotor functions: despite the fact that perceptual experience remains intact, it seems to be unavailable for use in visuomotor control. Otherwise there would be no dissociation between the ability to tell the size of an object and the ability to make anticipatory movements of the hand to grasp it. Information about size that figures in the subject's experience, Milner and Goodale claim, plays no role in the programming of grasping movements, for if it did movements would be accurately adapted to the size of objects. It also seems to follow that the dorsal stream doesn't contribute to perceptual experience, since the lesions on its structures cause no (apparent) deficit in perceptual tasks. If damage to the dorsal stream causes no loss in the subject's perceptual experience, then it appears that perceptual experience is a product of ventral-processing alone. However, the antecedent of this conditional seems problematic.

The reason it is problematic has to do with a tendentious interpretation of the symptoms that is influenced by the narrow view of experience. Milner and Goodale infer that "subjects' perceptual experience remains intact" (2004: 36) from the fact that they are able to issue accurate reports. The use of the adjective "intact" to describe the experience of optic ataxics presupposes that the deficit on visuomotor functions implies no loss for the contents of experience. According to Milner and Goodale, these subjects not only retain a capacity to issue true judgments based on their experience, but rather, the experience itself is unchanged despite the fact that they are unable to skillfully act on the base of it. Of course this interpretation makes sense, and is also inevitable, if the narrow view of experience is assumed --according to which the contents of perception are only those that the subject can report. If the only criterion for the ascription of perceptual contents is that the subject is able to report them, then accurate reports would constitute a sufficient condition to infer that there have been no losses in the contents of experience. However, if this view is cast aside (or at least bracketed) it is not so clear that the evidence supports Milner and Goodale's conclusion. In that case, all that the evidence shows is that there is a dissociation between the ability to make true perceptual judgments and visuomotor abilities. In other words, the evidence shows that optic ataxics' perceptual judgments remain intact. The further step, to claim that their experience is intact, requires to include the narrow view of experience as a premise.

For the moment I would merely like to cast doubt on this interpretation of the syndrome. The idea that it is possible to have an "intact" visual experience despite being incapable of acting on the base of it should be carefully considered. It goes against some current research on perception that claims that our experience is closely linked to our abilities to act. Some theories go as far as to claim that the link is constitutive (Noë 2004; Cussins 2003; Hurley 1998): our sensorimotor knowledge and abilities determine the contents of our experience. Therefore, the idea that visual experience may remain intact despite having no link to skillful action deserves a defense of its own, which is not given by the proponents of the dual visual stream hypothesis. The support for this idea given by empirical evidence presupposes the narrow view of experience, and thus begs the case against theories that establish a link between experience and motor activity.

B. Visual Form Agnosia

Visual form agnosia is the mirror syndrome of optic ataxia. It consists, roughly, in the inability to perform perceptual tasks that involve the use of information about form, in addition to the retainment of visuomotor abilities. This syndrome is the result of by occipito-temporal lesions, typically caused by anoxia, due to carbon monoxide poisoning --although there are similar clinical conditions that are caused by mercury poisoning, head trauma, or meningo-encephalitis.

Visual form agnosia is classified as a kind of apperceptive agnosia, thus distinguished from associative agnosia. The latter consists in the incapacity to categorize perceived objects and it is a deficit that involves both visual perception and conceptual processing. Apperceptive agnosia, on the other hand, is a deficit of visual perception that consists in the incapacity of the brain to form meaningful visual percepts by means of the binding of visual features such as shape, color, etc. That is, the incapacity to form a pictorial contextual representation of objects: a visual experience of an object. The two forms of agnosia are distinguished by their anatomical locations as well as their characteristic symptomatology.[13]

The central case discussed by Milner and Goodale (which also motivates a large part of their research) is that of DF (Dee Fletcher); a woman who suffered carbon monoxide poisoning, that caused a bilateral occipital lesion. The lesion consists of a selective necrosis on the lateral pre-

[13] For a detailed description of the symptoms of each kind of agnosia and a discussion regarding the taxonomy see: Jacob and Jeannerod 2003; Milner and Goodale 1995; 2004

striate cortex, on areas V2, V3 and V4. The lesion affects the transmission of shape information to the temporal lobe. The consequence of this lesion is a deafferentation of the ventral stream from its sources of information about form (the magno-cellular and parvo inter-blob channels). The temporal lobe receives information of color and texture from the parvo-blob channel through V1, V2 and V4. Form information reaches the parietal lobe through the dorsal stream and the tecto-thalamic stream that receive information from the mago-cellular channel (Milner and Goodale 1995: 134-7; Casagrande and Xu 2004: 501-2)

As a consequence of this lesion DF cannot perceive the shape of objects. This leads in turn to a difficulty in the recognition and discrimination of objects and simple geometrical shapes, drawings, and their orientations. DF preserves visual functions such as the ability to discriminate shades of color and the detection of patterns, which allow her to recognize familiar objects based on the properties of their surface. She preserves visual acuity to recognize fine details and an understanding of spatial relations between objects.

DF displays an incapacity to distinguish objects from their background in cases where there are no color or texture cues: "Dee said that objects seemed to 'run into each other', so that two adjacent objects of a similar color such as a knife and fork will often look to her like a single indefinable 'blob'". (Milner and Goodale 2004: 9-10). Although she is able to recognize numbers and letters by touch, she cannot do it by visual means. She is incapable of copying line drawings, despite being able to draw objects based on her memory. This is, perhaps, the main reason to classify her agnosia as apperceptive rather than associative. I will come back to this point below.

Despite these incapacities, DF preserves her visuomotor abilities intact. Milner and Goodale narrate the occasion when they became aware of this particularity of DF's syndrome, during an experimentation session:

> When we held up a pencil, we were not surprised that she couldn't tell us what it was, even though she could tell us it was yellow. In fact, she had no idea whether we were holding it horizontally or vertically. But then something quite extraordinary happened. Before we knew it, Dee had reached out and taken the pencil, presumably to examine it more closely […] Dee's movements had been quick and perfectly coordinated, showing none of the clumsiness or fumbling that one might have expected in someone whose vision was as poor as hers. (Milner and Goodale 2004: 17-18)

DF's behavior displays that her incapacity to make true reports on the contents of her experience does not affect her abilities to use visual information for object-oriented actions. DF behaves like a normal person and, from her behavior, it is hard to guess that she has a visual impairment (Milner and Goodale 2004: 19). She is capable of skillfully grasping objects and of catching them in the air when they are thrown at her. She is also able to negotiate obstacles and navigate through intricate paths. Milner and Goodale relate an occasion when they walked through a forest to a place where they had a picnic:

> This walk provided a good example of a time when the other side of Dee's visual life was strikingly revealed. To reach the meadow, we had to walk along a half-mile trail through a dense pine forest. The footpath was steep and uneven. Yet Dee had no trouble at all. She walked confidently and unhesitatingly, without stumbling, tripping over a root, or colliding with the branches of the trees that hung over the path. Occasionally we had to point out to her the correct route to take, but other than that, her behavior was indistinguishable from that of any of the other hikers on the mountain that day. We eventually arrived at the meadow and began to unpack the picnic hamper. Here Dee displayed once more how apparently normal her visual behavior was. She reached out to take things that were passed to her with the same confidence and skill as someone with completely normal sight. No-one would ever have guessed that she could not see the difference between a knife and a fork, or recognize the faces of her companions. (Milner and Goodale 2004: 19)

These abilities resemble those of another patient with visual form agnosia (SB), described by Jacob and Jeannerod (2003). Because of a meningo-encephalitis he had at the age of three, SB has a bilateral lesion at the occipito-parietal union, which impedes the discrimination and identification of shapes. However, SB preserves the visuomotor abilities necessary to drive a motorcycle and play ping-pong (Jacob and Jeannerod 2003: 88-9) DF and SB are capable of using for visuomotor control, the very information that seems to be inaccessible for perceptual tasks. In other words, the information that guides their actions is the same information that they are unable to report.

Milner and Goodale report to have carried out with DF the experiment designed by Perenin and Vighetto[14], in which the subject is presented with a slot, whose orientation the subject must report, verbally or manually, and then introduce her hand, or an envelope, through it. DF performed poorly on the perceptual task, and normally in the visuomotor task. Her ability to discriminate shapes was tested with a 3D version of the Efron test, which consists in presenting the subject with a series of rectangles with the same area but differing in length and width. The subject is asked to report which

[14] See Section 1.3.1A

of the rectangles have the same shape and which are different. DF had a very low performance in this task, as well as in the task of estimating the size and orientation of objects and reporting it by means of manual gestures or verbal reports. However, when asked to grasp the objects she showed an accurate adjustment of her hand movements to the size and shape of the objects. In the experiment of the "Blake Forms"[15] DF had opposite results to RV's: a normal performance in visuomotor tasks and a poor performance on the discrimination task.

Thus DF seems to be able to use visual information that is not part of her conscious perceptual experience (using Milner and Goodale's terms).[16] The interpretation of DF's clinical condition and the characteristic symptomatology of visual form agnosia is crucial for the formulation of the dual visual stream hypothesis. There are several points that deserve attention. First, what explains the deficit in perceptual tasks and the retainment of visuomotor abilities is the fact that there is damage to the structures of the ventral stream and not the dorsal stream. Perceptual tasks are dependent on ventral-processing, which is damaged in DF, while visuomotor tasks are dependent on dorsal-processing, which is intact in DF. I will not question this point.

Secondly,what makes the difference between the tasks that DF is successful at, and those at which she isn't, is the purpose that frames her movements: in visuomotor tasks movements are framed by a goal-oriented action, whereas perceptual tasks are framed by an act of communication[17]. According to the authors, the explanation of this difference in performance is that DF fails at perceptual tasks *because she has no visual experience to communicate*. They claim that DF's impediment is not at the level of the conceptualization and communication of the contents of her experience (since she has the ability to communicate other perceptual contents), but rather at the level of perceptual experience itself: "Dee could do none of these things [perceptual tasks]—not because she couldn't communicate but because she had nothing visual to communicate. She had no conscious experience, no conscious visual experience at least, of the orientation of the slot to share with us". (Milner and Goodale 2004: 29).

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[15] See Section 1.3.1A

[16] There are, however, certain limitations to DF's visuomotor abilities. For example, when a delay condition is introduced, or when she must insert complex objects in slots. For these tasks it seems that ventral-processing is crucial. The first case is particularly important to Milner and Goodale's hypothesis, since they claim that there is a close link between ventral processing and memory (unlike dorsal processing that only consists in the online, immediate control of motor adjustments)

[17] See Section 1.2

Milner and Goodale acknowledge that their primary source of evidence for denying that DF has visual experience of shapes is her incapacity to give accurate reports of the information in her visual field. The inference from DF's inability to give accurate reports to the claim that she lacks any experience of form is clearly influenced by the narrow view of experience, according to which every content of experience is a reportable content.

More explicitly, there seems to be an inference that runs as follows: Given that DF cannot make true judgments about form on the base of her experience, it follows that there are no contents of form in her visual experience. This inference can only be justified if, as a second premise, they assume the narrow view of experience. In a wider conception of perceptual experience, the use of visual information for the purpose of visuomotor control might be taken as evidence for the claim that such information *is* part of DF's experience. However, Milner and Goodale describe DF's visuomotor abilities as residual, more primitive, abilities; which are part of a system that guides motor activity in a quick and efficient way, without the involvement of the subject's conscious experience.

It is possible to cast doubt on this interpretation, arguing that the errors on perceptual reports do not show a lack of contents of form in DF's experience, but an inability to conceptualize such contents and emitting a report based on them. This objection can be found in Walhagen (2007):[18]

> What the results demonstrate is that D.F. is severely impaired at tasks that require her to indicate—to represent to someone else, be it verbally or by positioning her hand—aspects of an object's form (size, shape, orientation, etc.). Such tasks require D.F. to form a perceptual judgment about aspects of form [...] Forming a perceptual judgment, of course, requires one to perceptually identify certain aspects of perceptual stimuli, to bring those features under concepts. And this, I grant, is what D.F. cannot do. D.F.'s problem is a conceptual one: she cannot identify shapes, sizes, and orientations, she cannot 'bring them under concepts'. This is why she cannot perform the representational task of indicating to someone else, verbally or by positioning the hand, aspects of an object's form. However—and here is the crucial point—it does not follow that she is not aware, in a non-conceptual way, of the shapes, sizes and orientations of things (Walhagen 2007: 556)

[18] Walhagen's objections to Milner and Goodale's hypothesis, and the alternative reading he proposes for the empirical evidence, resemble my own on several points. However, there is a fundamental difference in the approaches we take. Whereas Walhagen bases his objection and his proposal on phenomenological notions (such as awareness, notice, attention, etc.), my objections are based on concepts that belong to neo-Fregean theories of content (concepts such as normativity, commitment, responsibility, judgment, etc.)

To question the interpretation of DF's symptoms as a deficit in visual experience, as Walhagen does, amounts to question the classification of visual form agnosia as a kind of apperceptive agnosia, instead of associative agnosia. However, Milner and Goodale provide additional evidence for this classification:

> Dee's difficulty in identifying objects or line drawings is not one of finding the right name for the object, nor is it one of knowing or remembering what common objects look like. Her problem is more fundamentally 'visual' than that. Dee has enormous difficulties in copying drawings of common objects or geometric shapes. Some patients who are unable to identify pictures of objects can still slavishly copy what they see, line by line, and produce a recognizable product. But Dee cannot even pick out the constituent elements of a picture in order to copy them. Presumably unlike those patients, then, Dee's problem is not one of interpreting a clear visual experience—her problem is that she doesn't have that clear visual experience to start with. (Milner and Goodale 2004: 10)

This point calls for the question of whether the ability to copy line drawings requires conceptual abilities or not. My intuition is that conceptual abilities do play a role in this task. In what follows I'll rehearse an argument to show that, under one description of the task, the successful copying of a line drawing requires the exercise of conceptual abilities in the formation of true perceptual judgments. Under this description, even if the task doesn't require the subsumption of contents under concepts, it does require that the subject exercises her ability to form judgments, which is a conceptual ability, par excellence --at least in the philosophical framework in which this debate is situated.

What are the necessary steps to copy a line drawing? One possible description of the task is the following: (1) to perceive the whole drawing; (2) to analyze its parts; (3) to recognize the spatial relations between the parts; (4) to reproduce each of the parts in a manner that respects the spatial relations between them in the original drawing; (5) to form comparative judgments of the resemblance between the original and the copy, as the task is performed (in order to go on, or correct any mistake) and when the copy is finished (in order to assume the task is done, or to correct the drawing).[19] Success in this task consists in the drawing of a faithful copy of the original. This requires that the subject draws the lines in a way that reproduces the relations between the lines of

[19] This description of the task may seem arbitrary, but it is an analysis of the description made by Van Gulick (1994) of visual agnosics while performing the task: "In copying drawings, visual agnosics employ a slow mechanical line by line technique that involves lots of careful back and forth comparison of small line segments in the original drawing with the details of their copy" (Van Gulick 1994: 45)

the original drawing. This requires, in turn, that the subject is able to discriminate the parts and to appreciate the relations between them.

It is plausible that steps (2), (3) and (5) require the subject to form true perceptual judgments. (2) requires the capacity to discriminate the parts of the drawing; that is, to identify the lines that compose it. The criterion for this discrimination is no other than the orientation of the lines (some vertical, some horizontal, some curve, etc.) and the continuity or discontinuity between them. This is exactly the kind of perceptual task that DF is unable to perform, and that requires the articulation of the contents of perception in judgments such as: "line *a* has orientation *x*", "line *b* has orientation *y*", "orientations *x* and *y* are the same/different", "*a* is different/equal to *b*" etc. (3) requires the capacity to analyze the spatial relations between parts of the drawing. This requires, in turn, that the subject is able to appreciate the orientation of some lines relative to others. Once again, this requires the ability to form judgments such as: "lines *a* and *b* are perpendicular/parallel", "lines *a* and *b* have the same/different orientation", etc. I do not mean that the task requires the possession and use of concepts such as "parallel", "perpendicular", "horizontal", etc., rather, that the performance of the task requires that the subject is able to understand the spatial relations denoted by this concepts, and to judge whether these relations hold between the different parts of the drawing. Finally, (5) consists in a comparison of the copy and the original that the subject must make in order to know whether the copy is sufficiently similar to the original, and whether the task is going well, or is finished. This step involves the formation of comparative judgments, such as: "the copy is equal to the original", "the copy differs from the original in such and such parts", etc.

But why do I claim that these steps require the ability to form judgments? As I explained in Section 1.2, there are several tasks that require the mediation of a perceptual judgment: those that consist in reports. Among these tasks I included the indication of the size of an object with the tips of the fingers, the indication of orientation with the orientation of the hand, etc. Success in these tasks requires that the subject forms a true judgment based on the contents of her experience. By the way, Milner and Goodale assert that the drawing of a line to, say, show the orientation of a slot is a communicative act of this same kind (Milner and Goodale 2004: 29).

If Milner and Goodale acknowledge that these reports involve perceptual judgments, it is not so clear why they would deny that the copying of a line drawing involves perceptual judgments as well. Their claim is that copying a drawing does not involve conceptual abilities, in the sense that it

doesn't involve the subsumption of contents under general categories. However, if judgment is considered (as it has been by traditional analytic philosophy) the conceptual exercise par excellence, then it is not clear that the task does not require conceptual abilities.

My argument intends to show that there is at least one description of the task under which it may be said to involve perceptual judgments. If Milner and Goodale were to deny that the task requires judgments, they would need a reason to support the distinction between this task and the task of drawing a line to indicate the orientation of a slot, which apparently does require a judgment. Of course, there may be other descriptions of the task in which it does not require the subject to form perceptual judgments. I do not want to commit to the idea that this is the only, or the best, description of the task. Ultimately, there may be no way of telling whether it does require judgments or not --al least with the available evidence. My claim is, rather, that the failure to copy line drawings does not necessarily justify the conclusion that DF has no experience of form, since this failure could be explained as a consequence of an incapacity to form perceptual judgments. Thus, even if DF's visual deficit is not related to her ability to name objects (i.e. to subsume contents under concepts), it is still not clear that the only explanation for her inabilities is that she does not have visual experiences of form.

I do not mean to question whether DF'd pathology should be classified as a kind of apperceptive agnosia or a kind of associative agnosia. What I want to point out is that her symptoms could be explained as an inability to articulate contents of form into perceptual judgments. This inability would explain the fact that she is unable to give accurate perceptual reports and her inability to copy line drawings. Milner and Goodale's conclusion that the explanation for DF's symptoms is that she has no contents of form in her experience, presupposes the narrow view of experience.

Milner and Goodale's interpretation of DF's symptoms has a further consequence, which I consider undesirable: if DF's agnosia was not specific to certain features of objects, but was generalized to all visual features (including color and texture), it would follow that DF would have no visual experience whatsoever. If DF was unable to make true judgments about every visual feature of objects, she would not have visual experience at all. This would place her in the same condition as blindsight patients:

> Our interpretation of apperceptive agnosia would predict, however, that some patients should suffer from generalized losses in the perception not only of form, but also of

> colour, texture, and allocentric space. Indeed, lesions causing an extensive occipitotemporal disconnection should result in a global apperceptive agnosia that would, in the limit, be experientially indistinguishable from cortical blindness, which we consider to result from an isolation of the ventral stream from visual inputs (Milner and Goodale 1995: 128)

In the next section I will argue that there are important differences between blindsight and visual form agnosia that Milner and Goodale fail to recognize.

C. Cortical Blindness

The name of "cortical blindness" or "blindsight" has been given to a pathological condition caused by lesions in the primary visual cortex (V1). In some cases the damage to V1 is total and affects the whole visual field. In other cases, the lesion is restricted to one hemisphere and the "blindness" is restricted to the contralateral hemifield. In these cases, the pathology is known as "hemianopia". In other cases, the lesion is local and only affects a restricted area of the visual field, which is known as "scotoma".

The name *blindsight* has been given to this pathology to suggest a sort of paradox in the clinical condition: despite the fact that the patients cannot report conscious experiences in the affected portion of the visual field, they seem to be able to use information for the guidance of certain movements. The condition is similar to visual form agnosia, but has several relevant differences. In the first place, it is not restricted to one visual feature, but it is generalized to all visual stimuli. I will mention and discuss other differences below.

The symptoms of cortical blindness have a clear explanation in the dual visual stream theory: The ventral stream, which is responsible for perceptual experience, is entirely dependent on V1. Damages to this area leave the ventral stream deafferented. Since no information is transmitted to the temporal lobe, subjects have no visual experience. However, the dorsal stream has alternative sources of information, as the tecto-pulvinar stream. This starts from the retina and reaches the parietal lobe going through subcortical structures, such as the superior colliculus (where 10% of optic fibers culminate), and the pulvinar nucleus of the thalamus. Thus, the dorsal stream continues receiving information through other channels that are not affected by the damage to V1. In the frame of Milner and Goodale's hypothesis, the absence of perceptual reports is explained by the

deafferentation of the ventral stream, whereas the use of information for visuomotor control is explained by the residual functioning of the dorsal stream.

Descriptions of the behavior of blindsight patients is very much like that of patients with visual form agnosia. They perform poorly in perceptual tasks and report no stimulus in the affected area of the visual field. However, they can successfully carry out visuomotor tasks: they can make saccadic movements and point in the direction of the stimulus, which they report not to perceive. They are able to make the anticipatory adjustments of the arm, hand, and wrist in order to grasp objects of different shapes, sizes and locations, but cannot report the size of the objects. They have the same results as DF in Perenin and Vighetto's experiment: they cannot report the orientation of a slot, yet they are able to insert an envelope through it.[20]

As I have mentioned in previous sections, the criterion used to deny that blindsight patients have visual experiences is the subjects' inability to give perceptual reports: "The definition of 'cortical blindness' is in fact based on only one particular index of visual capacity—namely that of perceptual report" (Milner and Goodale 1995: 69). In virtue of this fact, Milner and Goodale maintain that cortical blindness can be explained as an absence of visual experiences, in addition to residual visuomotor functions in the dorsal stream: "It is clear from our discussion in this chapter so far that we do not consider blindsight to be well characterized as 'unconscious perception', as many writers would have it. We believe that it is more correctly seen as a collection of residual visuomotor responses that may depend on a variety of relatively independent circuits in the superior colliculus and dorsal stream" (Milner and Goodale 1995: 75).

As I mentioned in the previous section, Milner and Goodale characterize cortical blindness as similar to visual form agnosia. There are, however, some dissimilarities that should not be ignored and that, I believe, have important consequences for the philosophical interpretation of the dual visual stream hypothesis. In the first place, unlike DF and SB[21], blindsight patients behave as blind people: they are unable to navigate or negotiate obstacles: "Cortically blind patients behave like completely blind people, except that their pupillary reflex to light is preserved: they do not see objects, they cannot orient in space, they bump into obstacles, etc." (Jacob and Jeannerod 2003: 75). On the other hand, as Milner and Goodale report, visual form agnosics' behavior doesn't reveal

[20] See: Sanders et.al. (1974); Perenin y Jeannerod (1975); Weiskrantz (1986); Perenin y Rosetti (1996).

[21] See Section 1.3.1B

their impairment. They are able to catch objects in the air, walk through a forest and even drive a motorcycle.

These activities can hardly be explained without appealing to some type of perceptual access to form information. Especially if one considers that, in the absence of this information, it is hard to discern objects from their background, which seems to be a condition for negotiating obstacles. Although Milner and Goodale hold that DF's brain has access to visual information about form, this access is restricted to the subpersonal module of the dorsal stream. The explanation of her success in visuomotor tasks is the same as that of blindsight patients.

Secondly, in the cases of cortical blindness, visuomotor abilities are only manifested in "forced choice" situations. These patients cannot spontaneously self-prompt the use of the visual information that is available to their dorsal stream. They can only do so in situations where an experimenter asks them to produce an automatic response: "This striking phenomenon, however, could not be observed unless patients were placed in a, so called, 'forced choice' situation in which no conscious report about the presence and the nature of the visual stimulus was required, and in which they were invited to produce an 'automatic' response to it" (Jacob and Jeannerod 2003: 75) This fact strongly contrasts with Milner and Goodale's descriptions of the picnic they had with DF, or the moment when she spontaneously grabbed a pencil to examine its shape (Milner and Goodale 2004: 17-9)

These differences can be explained at the neurophysiological level by the fact that, in blindsight, the dorsal stream is deafferented from its sources of information in the visual cortex, which leaves only a group of primitive and impoverished functions: what Jacob and Jeannerod describe as a "primitive system of quick and crude reactions to visual stimuli" (2003: 76). Blindsight patients can only produce automatic responses to visual stimuli in forced choice situations, so their use of visual information is not integrated to the rest of their conduct. This can be explained by the fact that their dorsal stream only gets information from subcortical structures. Visual agnosics, on the other hand, seem to be able to integrate their visuomotor abilities with the rest of their behavior. This can be explained by the fact that their dorsal stream preserves its cortical sources of information. However, this merely physiological explanation of the differences in the conditions seems to put aside an important element: an explanation of the difference at the personal level. In other words, the physiological explanation excludes an account of the role that visual information plays in the

subjects' cognitive lives, which seems to be important for the explanation of both differences I have mentioned.

One plausible explanation would be that these differences are explained by the fact that visual form agnosics do have some type of perceptual access to form information but they are unable to articulate it in perceptual judgments and, hence, cannot report it or use it for the task of copying line drawings. This is suggested by the fact that this information seems to be integrated in patients' behavior, and available for the spontaneous initiation of actions. On the other hand, the visual information available for motor control in blindsight patients seems to be encapsulated. This suggests, in fact, that they have no visual experiences.[22] This interpretation is, however, beyond the reach of Milner and Goodale's theory, since it requires a wider view of experience. This suggested interpretation widens the notion of perceptual experience beyond the contents that subjects can report and beyond the products of ventral processing. Given the narrow view of experience, Milner and Goodale can only explain the difference between the two conditions in neurophysiological terms. To them, a case of global visual agnosia would be "experientially indistinguishable" from a case of cortical blindness (1995: 128).

Milner and Goodale characterize visual experience, a personal level, cognitive phenomenon, as a product of ventral processing. In the absence of ventral processing, there is no visual experience whatsoever: "Larry Weiskrantz once characterized dorsal-stream vision as, "in a sense, blindsight without blindness". We maintain that the nature of both dorsal-stream vision and blindsight stand in sharp contrast with visual processing in the ventral stream, even when that processing fails to reach awareness. The processing of vision for perception – conscious or unconscious – is, according to our model, restricted to the ventral stream" (Milner and Goodale 2008: 776). The quote suggests that the authors group together all cases of dorsal processing (visual agnosia and cortical blindness), as cases of visual non-perceptual processing, because neither of them involves the ventral stream. Hence there is no difference between these two conditions in terms of the information to which subjects' have access in their experience.

There are important differences between the two conditions, which should be considered. The base of the narrow view of experience serves is a justification to group them together, as Milner and

[22] Once more, this view is supported by Walhagen: "[T]he more plausible view is that D.F. is (nonconceptually) aware of aspects of form. For one thing, D.F.'s ability to behave appropriately with respect to shape and orientation is very good, much better than is a blindsight patient's" (Walhagen 2007: 556)

Goodale do, insofar as both conditions coincide in the fact that patients are unable to accurately report experiences. In the light of this view, both conditions involve visual non-perceptual content. If this view is bracketed, it is not so clear whether both conditions should be grouped together in the way that Milner and Goodale do. In Chapter 4 I'll examine in more detail the reasons to adhere to Milner and Goodale's view and the reasons to accept a wider view of experience that allows to give different explanations, from the personal level of description, to cortical blindness and visual agnosia.

To sum up, so far I have analyzed Milner and Goodale's proposal and their reading of empirical evidence. Their proposal partly consists in equating visual experience to the product of ventral processing. The authors seek to justify this assimilation by presenting empirical cases that make the case for a double dissociation between perceptual tasks and visuomotor tasks. However, Milner and Goodale's presentation of the evidence, and their conclusion, are influenced by the narrow view of experience. Moreover, the validity of their inferences from the evidence to their proposal heavily depends on it. This view is not justified within the theory. It works as an implicit assumption, that permeates the criterion for the attribution of perceptual experiences. There are some consequences that follow from Milner and Goodale's reading of the evidence that turn out to be highly counterintuitive and potentially problematic.

1.3.2 Dissociations between perception and visuomotor control in healthy subjects

This group of experiments can be divided in two subsets. In the first place, there are experiments that show that despite subjects' unawareness of certain stimuli, subjects' are still able to adjust their bodily movements to those same stimuli. In the second group there are experiments that show the adequate function of visuomotor processes despite the presence of perceptual illusions. I will describe and discuss one series of experiment from each group.

A. Visuomotor adjustments without awareness

In the past decades there has been a series of experiments that intend to show that even in healthy, unimpaired subjects there is a dissociation between perceptual and visuomotor tasks. The way Milner and Goodale state this dissociation is as follows: "[I]t must follow from our arguments that even in neurologically intact individuals, the visual information underlying the calibration and

control of a skilled motor action directed at an object will not always mirror the *perceptual judgements* made about that object" (Milner and Goodale 1995: 157. My italics). It is worth to notice Milner and Goodale's formulation of the dissociation, as it is stated in the quote. Here they talk about perceptual judgments, though not necessarily about the content of experience (although, as I've shown in this chapter both notions are interchangeable in their theory). My contention in this section will be that the results of experiments only support their claim as it is stated in the quote, and not the stronger claim that there is a dissociation between visuomotor control and perceptual experience.

Goodale et.al. (1986) designed an experiment to show that visuomotor adjustments in response to changes in the visual field does not necessarily go hand in hand with an awareness of these changes. The task subjects were required to perform consisted in reaching their hand towards a target (a light), while their hand was hidden from them. Initially they would foveate a light in the periphery that would turn off once the target appeared. During the time it takes for the subject to make a saccadic movement towards the target, it could move 10º to the right or left. In 50% of the trials the target would change its position, and in the rest it would remain in its initial location.

The results showed that despite saccadic suppression, in the trials when there was a change in the position of the target, the trajectory of the subject's hand was corrected and adjusted to the new position of the target. Besides, the saccadic movement terminated with the target centered in the fovea, whether it had moved or not. So despite the lack of awareness of the shift in the target, due to saccadic suppression, hand movements were reliably adjusted to those shifts: "These and other experiments using the same paradigm have consistently shown that subjects fail to perceive changes in target position even though they modify their visuomotor output to accommodate the new position of the target" (Milner and Goodale 1995: 162). A consequence of these results is that visuomotor adjustments are not guided by subjects' visual experience, but rather by visual information that fails to reach awareness.

Catiello et.al. (1991) report a similar experiment, which involved the additional task of emitting vocal reports when a change in the target's position was perceived. Subjects' vocal response would take 300ms longer than the motor adjustment. This shows, claim Milner and Goodale, that perceptual awareness of a stimulus takes longer than visuomotor responses, which is why it is not possible that the latter are based on the contents of experience.

Milner and Goodale (1995) use the engineering considerations exposed at the beginning of the chapter to explain these results. Their interpretation is based on the idea that perceptual and visuomotor tasks have different computational requirements. For visuomotor control there are critical factors, such as time, and a very precise location of the target-object. Hence it must be sensitive to small changes in the visual field and give a quick response to compensate for the changes in the object's position. For perceptual experience, on the other hand, time does not play such a crucial role, and the suppression of small changes may even be advantageous in order to obtain stability and perceptual constancies, which are necessary for object identification. It does not require a precise location of the object, but rather its position in relation to other objects.

These different requirements explain, according to Milner and Goodale, that there is a motor response to the shift in target position despite the fact that subjects are not aware of it.

> [T]he apparent constancy of target position observed in the experiments described above (for example, Goodale et al. 1986) can be seen as part of a constellation of perceptual constancies by means of which the size, shape, color, lightness, and relative location of objects are preserved across a variety of viewing conditions. […] As we have already suggested, it is [the] concern with the location and disposition of objects in egocentric space that helps to explain why, in the Goodale et al. (1986) study, the aiming movements of subjects are sensitive to shifts in the location of the target even though those shifts in location are not perceived. We would suggest that all of the various discrepancies that have been observed between the visuomotor performance and perceptual reports of normal subjects may reflect the differential processing characteristics of the dorsal and ventral streams (Milner and Goodale 1995: 165)

As mentioned at the beginning of this section, it is worth noting that the dissociation shown by these experiments is not necessarily one between subjects' experience and motor control. What the experiments clearly show is a dissociation between perceptual judgments and visuomotor adjustments. The conclusion that subjects have no experience of the shifts in target position presupposes that subjects can only experience what they are able to judge and report.[23]

Johnson and Hagaard (2005) report a similar experiment that shows that even though subjects may not report a change in target position, they do seem to have a type of experience of the change in the trajectory of their reaching movement. This version of the experiment has three phases. In the first

[23] For a similar critique of Milner and Goodale's interpretation, see: Walhagen 2007: 553-4

subjects were asked to reach to the target, reproducing the conditions of Goodale et.al.'s experiment. In the second phase subjects were asked to reproduce the trajectory made in the first, while their hand is still hidden from them. In the third stage they were asked to report whether they'd seen a shift in the target.

The results of the first phase were similar to those described above. There were adjustments in the trajectory of the reaching movements, which were proportional to the displacement of the target. In the second phase, subjects accurately reproduced their hand trajectory made in phase 1. In the third phase, subjects reported a change in the target in 37% of the trials where there was a change. What is interesting about these results is that the adjustment of the reaching movement and the reproduction of that movement were independent of subjects' awareness of a change in the target. That is, even in trials where subjects didn't report a shift, the adjustment of the trajectory and its reproduction were accurate.

The authors interpret these results as follows: motor adjustments in the first phase show a visuomotor response to the changes in target position that is independent from subjects' awareness of such a change. The accurate reproduction of the trajectory in the second stage shows a sort of "motor awareness", or "motor experience". Given that the reproduction of the movements was accurate in most trials, independently of the report of a target shift, this can be seen as evidence that subjects have some kind of awareness of the adjustment in their reaching movement that is independent from their perception of change in the target.

> Our measures of motor awareness did not differ significantly according to whether subjects were aware of the target shift or not. This demonstrates the novel finding that motor awareness can dissociate from perceptual awareness. […] This pattern of results seems quite paradoxical. The subjects clearly knew, in some sense, that their initial movements contained a lateral deviation. It is tempting to speculate on how subjects reconcile this awareness of their own motor adjustment deviations with manifest unawareness of any reason why the movement required adjusting. (Johnson y Hagaard 2005: 232-3)

These results show that Milner and Goodale's interpretation, which postulates a polar opposition between unconscious visuomotor adjustments and perceptual experience, does not account for all that is going on in these cases. Johnson and Hagaard's "motor awareness" holds no place in Milner and Goodale's dual hypothesis.

Milner and Goodale could reply to this challenge by saying that subjects aren't aware of their motor adjustments, and that the reproduction of the trajectory in the second phase is an automatic movement programmed by subpersonal processes. This reply, however, would once again presuppose the narrow view of experience. It would presuppose that information that is not reported isn't a part of subjects' experience, but an input to an automatic, subpersonal and unconscious process. Of course this is a plausible interpretation of the results. I do not want to claim that Milner and Goodale's interpretation is incorrect, but only that it is not the only one that is consistent with the evidence.

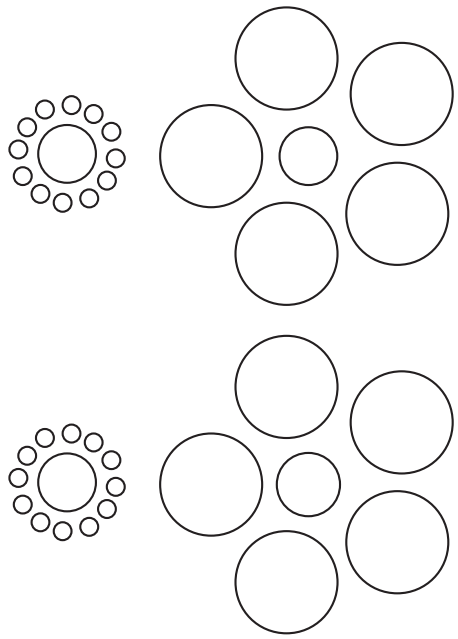
They could also reply that the accurate reproduction of the movement has nothing to do with the visual system, but rather with the somato-sensory system and some sort of short-term motor memory. In such a case, their claim regarding visual experience still holds. A new experimental model would be needed to figure out whether visual experience plays any role in the guidance of the hand movement in the second phase.

B. Perceptual illusions and visuomotor control.

One of Milner and Goodale's predictions is that perceptual representations formed by ventral processing should be prone to optic illusions, whereas dorsal processing is not. According to their theory, the ventral stream codifies the metrics of objects in relation to the rest of the perceptual scene. Size contents of perceptual experience are comparative. Visuomotor control, on the other hand, requires information about the real size of objects. Hence the dorsal stream codifies an absolute metric for objects.

If the theory is correct, it would follow that visual experience is prone to size-contrast illusions, while visuomotor control is not. Aglioti et.al. (1995) report an experiment in which this prediction was tested. Subjects were presented with an array of tridimensional discs, arranged like the circles of the Ebbinghaus Illusion (also know as the Tichener Circles). In this classic example of size contrast illusion, the central discs of the top drawing are physically the same, but the one on the right appears smaller than the one on the left. In the bottom drawing, they appear to have the same size, but the central circle on the left is actually larger than the one on the right.

Subjects were presented with either the upper or the lower drawing, and were asked to perform two tasks: (1) point to the left circle if they were the same size, or point to the right circle, if they were different. (2) Grasp the disc at which they pointed. The first is a perceptual task. It responds to the question “are the sizes of the central discs equal or different?” and requires the subject to perform a comparative judgment, and communicate the judgment by pointing to one of the discs. The second is a visuomotor task.



As the dual stream theory predicts, results showed that subjects were clearly under the influence of the visual illusion: when presented with the upper drawing, they pointed to the right, and when presented with the lower drawing, they pointed to the left. However, their grasping movements, which were measured with opto-electrical devices, were accurately calibrated to the real size of the disc: “In short, grip size was determined entirely by the true size of the target disc. Thus, the very act by means of which subjects indicated their susceptibility to the visual illusion (that is, picking up one of the two target circles) was itself uninfluenced by that illusion” (Milner and Goodale 1995: 169). Processes of visuomotor control are not affected by size-contrast, and maintain their precision despite the perceptual illusion: "In nearly all cases, the illusions have been found to have little or no effect on the scaling of grasp or the trajectory of a reaching movement despite having strong effects on perception" (Milner and Goodale 2004: 89).

In Haffenden and Goodale (2000) a version if the experiment is reported in which a third task was included: subjects were asked to show an estimation of the size of the discs with the tips of their fingers. Once more, it was evidenced that performance in this (perceptual tasks) was under the influence of the illusion, while visuomotor control was not.

> These results indicate that the visual mechanisms underlying perception and visuomotor control can operate independently, in normal subjects […] Although we often make subtle relative judgements of object size, we rarely make absolute judgements. In contrast, when we reach out to pick up an object, particularly one we

> have not seen before, our visuomotor system has to compute its size accurately if we are to pick it up efficiently, that is, without fumbling or readjusting our grip. (Milner and Goodale 1995: 169-70)

Milner and Goodale interpret these results as showing that the illusory content of perception was not guiding the grasping movements. What guided these movements was the unconscious information in the dorsal stream, which was not part of the subjects' visual perception. This inference seems to be supported by the idea that, if perceptual contents were guiding the movements, then there would be inconsistent contents in perception (there would be an illusory content of the size of the discs and an accurate content as well). However, this interpretation is also influenced by the narrow view of experience.

In order to assert that the contents would be inconsistent, it must be supposed that they are propositional. Inconsistency is a property of a set of propositions, which cannot be simultaneously true. [24] For the subjects' experience to be inconsistent, it would have to contain the following propositions:

- The disc on the left is size *a*
- The disc on the right is size *a*
- The right disc is smaller than the left.

These propositions would constitute an inconsistent set. What remains doubtful is whether the three of them can be attributed to the subject's perceptual contents. As far as the evidence goes, only the third can be attributed to the subject's experience. However, according to the narrow view of experience, if the real size of the disc is a content of the subject's perception, then it must be the sort of propositional content that can be inconsistent with the comparative judgment. But if this conception is cast aside, there need not be any inconsistency. That is, if the subject perceives the real size of the disc but this content is not propositional (i.e. not truth-evaluable), and cannot be articulated in a judgment, then there is no inconsistency between that content of experience and the propositional content that the size of the discs is different.

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[24] Someone might reply that there are other types of inconsistencies, such as performative inconsistencies, that do not hold between propositional contents alone. However, insofar as the notion of consistency is defined in terms of the notion of truth (i.e. truth has explanatory priority over consistency), things of which consistency can be correctly predicated must be truth-evaluable and, therefore, they must be able of being propositionally articulated.

To sum up, experiments cited to support the claim of a dissociation between perceptual experience and visuomotor control do not necessarily justify Milner and Goodale's bold proposal. These experiments show a dissociation between the contents of judgments and the information that guides grasping and reaching movements. The further inference that the information guiding the movements is not a part of the subject's experience requires the presupposition of the narrow view of experience.

1.4 Conclusions of the chapter

Milner and Goodale's bold proposal sharply distinguishes perceptual experience from visuomotor control. Beyond claiming that each of them is implemented by an independent brain system, it holds that there is an inaccessibility between the contents of experience and the information that guides motor control. This hypothesis is supported by a wide variety of empirical evidence. However, I have shown in this chapter that the interpretation of this evidence is influenced by a particular view of perceptual content, which I have called: the narrow view of experience. According to this view a subject's perceptual experience is restricted to those contents that are prone to be part of judgments and can be reported. If this view is bracketed, the evidence that Milner and Goodale put forward can only justify a weaker thesis: that there is a dissociation between information that guides motor control and the contents of experience that are judged and reported by subjects. Additionally I have explained some reasons that suggest the need for a wider view of experience, such as the need to account for motor awareness, an explanation of the behavioral differences between blindsight patients and visual agnosics, and the intuition that the contents of experience cannot remain intact if the subject is unable to act skillfully on the base of her experience.

In the following chapter I will put forward an argument that intends to show that Milner and Goodale's hypothesis leads to an unsatisfactory view of intentional action. In the chapters that follow, I will argue that if a wider view of experience is adopted, then it would be possible to give a better explanation of intentional action, which is consistent with a moderate reading of empirical evidence.

Chapter 2
Intentional Action and the Dual Visual Streams hypothesis

In the previous chapter I argued against Milner and Goodale's "bold proposal". The chapter attempted to show that the hypothesis does not follow from the empirical evidence presented by the authors, unless a particular view of perceptual experience is already assumed: a view according to which the contents of experience are only those that can be reported or, in other words, those that can be articulated within a perceptual judgment. If this view is bracketed, the evidence provided by Milner and Goodale only shows that: (1) there is division at the neurophysiological level; and (2) there is a double disassociation between the abilities to make true judgments about the perceptual environment and visuomotor abilities.

In this chapter I will argue that Milner and Goodale's bold proposal is not only based on a tendentious reading of the evidence, but also leads to undesirable philosophical consequences regarding the understanding of intentional action. If one adopts this hypothesis, one must also adopt a view of intentional action where it is split in two separate components. I will argue that this understanding does not do justice to crucial features of intentional action.

2.1 The tele-assistance model

Milner and Goodale's dual hypothesis postulates two processing streams of visual information. On the one hand, the ventral stream takes care of processing visual features in the way needed for the categorization and recognition of objects. For this, it must compute the object's spatial properties, using a relative metric and an allocentric coordinate system, and the object's invariant features, to obtain perceptual constancies. Ventral-dependent processing constructs a visual representation of the world that constitutes the experience of the subject. On the other hand, the dorsal stream is in charge of processing visual features of objects in an appropriate way for visuomotor control. For this, it must compute the absolute metric of objects and their location with respect to the subject's body, with a constant update. Dorsal-dependent processing functions independently of the visual experience of the subject, in the sense that information processed for visuomotor control is not accessible to the subject's experience, and the contents of the experience are not available for motor control.

From this formulation of the dual hypothesis comes a model of intentional action described by Milner and Goodale by comparison to tele-assistance mechanisms, which are typically used for robot control in hostile environments. In such mechanisms action is executed through the interaction of two elements. On the one hand, there is a human operator perceiving the visual scene in a distanced manner: through a screen, say, in which there are images captured by a camera incorporated in the robot. The human operator can order the robot to execute an action upon a specific object in the robot's "visual field" (for example "move the stone ahead"). On the other hand, the robot is situated in the scene, has access to updated information about the position of objects in relation to its effectors, their real size, and can engage in sensorimotor routines through which it executes the operator's orders.

> In tele-assistance the human operator doesn't have to worry about the real metrics of the workspace or the timing of the movements made by the robot; instead, the human operator has the job of identifying a goal and specifying an action toward that goal in general terms. Once this information is communicated to the semi-autonomous robot, the robot can use its on-board range finders and other sensing devices to work out the required movements for achieving the specified goal. In short, tele-assistance combines the flexibility of tele-operation with the precision of autonomous robotic control. (Milner and Goodale 2004: 99)

Milner and Goodale's hypothesis is that ventral-dependent processes resemble the work done by the human operator who has a representation of the scene, on the basis of which a target and a general action course are fixed. The dorsal system resembles the robot, lacking a perceptual representation but with constantly updated information of the scene and sensorimotor knowledge that allows it to engage in activity routines and control them on the basis of the newly updated information. In this way, the subject's perceptual representation helps select a kind of action and a target-object to determine the course of action. In the meanwhile, dorsal non-perceptual information guides the execution of sensorimotor routines that are activated by the subject's decision.

> Our current conception of how the two visual streams interact in the animal or human brain corresponds nicely to this engineering principle. The perceptual systems in the ventral stream, along with their associated memory and other cognitive systems in the brain, are rather like the human operator in tele-assistance. They identify different objects in the scene, using a representational system that is rich and detailed but not metrically precise. When a particular goal object has been flagged, dedicated visuomotor networks in the dorsal stream, in conjunction with output systems elsewhere in the brain (located in other brain structures including the premotor cortex, basal ganglia, and brainstem) are activated to perform the desired motor act. In other words, dorsal stream networks, with their precise

> egocentric coding of the location, size, orientation and shape of the goal object, are like the robotic component of tele-assistance. Both systems have to work together in the production of purposive behavior— one system to select the goal object from the visual array, the other to carry out the required metrical computations for the goal-directed action (Milner and Goodale 2004: 100)

This division of labor can be understood as a division between the *planning* and the *programming* of an action (Milner and Goodale 2008). The planning consists in the identification of a target-object and the selection of an action type. The programming consists in the detailed specification and online control of bodily movements using visual information.

It is important to notice that, according to this model of intentional action, the subject never has conscious perceptual access to the information that guides the execution of her actions. She only has access to the perceptual representation produced by ventral processing. The action executing control happens at an unconscious level. It can be said that the functional distinction between the roles of the ventral and dorsal streams is mapped into a distinction between the kind of information to which the subject has conscious perceptual access and that is used to select action courses, and the unconscious information that guides motor activity through the execution of sensorimotor routines.

For this reason, Andy Clark (2001) argues that Milner and Goodale's theory provides evidence against the assumption of Experience Based Control (EBC), according to which our visual experience presents us the world in a manner appropriate for the control of our motor activity.[25] Clark holds that the view that is most consistent with Milner and Goodale's theory is a hypothesis he calls Experience Based Selection (EBS): “Conscious visual experience presents the world to a subject in a form appropriate for the reason-and-memory-based selection of actions.” (Clark 2001: 512). As I mentioned in the previous chapter, the visual representation of the world obtained by ventral processing provides flexibility and intelligence to action. According to the tele-assistance model and EBS, perceptual experience allows a selection of action courses that is sensitive to memory and reason. In other words, allows subject's actions to be rational and appropriate in the light of the contents of her visual experience. However, the contents of experience do not play any role in the guidance of bodily movements through which the selected action is executed. Furthermore, they could not in principle play such role, for they do not have the appropriate form

[25] See Chapter 1, sections 1 and 2

for that function. In Clark's words, the role of visual perceptual experience in the guidance of action is the following:

> [C]onscious seeing makes its contribution at a rather more executive level: a level that guides my behavior only in the same sense as my love of pasta may be said to guide my selection of a menu item" (Clark 2001: 511)
>
> The required distinction is that between providing the information used to compute the gross aspects of the reach and merely providing a specification of the target and action type required. It is the difference between telling the waiter to get the apples from the pantry and providing at least a rough sketch of the motion that would get the waiter to the pantry (Clark 2007: 576).

We have, then, an extrapolation of a division in visual processing to a division in intentional action. Just as there are two clearly distinguishable components in vision, there are also two clearly distinguishable components in action: selection (or planning) and execution (or programming). Selection is a process that is based on reason and the visual experience of the subject. Execution is the process of sensorimotor routine activation. This distinction could be characterized as a distinction between a personal level and a subpersonal level phenomena. There are reasons that suggest this interpretation, which I will explain below.

2.1.1. The tele-assistance model and the personal/subpersonal distinction

To start, it is important to make clear the way that the personal/subpersonal distinction is going to be understood. We could start with the criteria provided by Dennett (1969) and Bermúdez (2000; 2003) to distinguish the phenomena proper of the personal level. These criteria are: (1) states and processes can be legitimately attributed to the person, and not only to a module or subsystem of her brain, understanding *person* as a rational agent (Dennett 1969); (2) the operative principles are not the nomological principles of the physical world ---nor principles that could be reduced to nomological relations among events (Bermúdez 2003). The latter can be analyzed in two components: (a) at the personal level of explanation there is a distinctive set of regularities; and (b) the explanation of personal level phenomena is subject to normative constraints like the rationality principle (2000). This criteria can be understood in several, some problematic, ways.[26]

[26] See: Bermudez 2003: 201-205

To avoid the problems brought by certain formulations, I will assume the distinction as McDowell (1994a; 1994b) presents it. McDowell holds that the personal level is the only one in which there can be talk about genuine content (1994b), that is, where there is a direct relation between a subject and her environment. Genuine content is what puts the subject in contact with her environment. This opposes to the "as-if" content of subpersonal level, in which there is only contact with structural properties of the received inputs.

> A sub-personal informational system is a physical mechanism, connected to its surroundings by transducers that convert physical impacts from outside into events of the sort that the system can work on, and perhaps by transducers that convert the system's end-products into physical interventions in the exterior. The system knows nothing even about the character of the immediate physical impacts on the input transducers, or the immediate physical interventions in the exterior that result from its operations by way of output transducers, let alone about the nature and layout of the distal environment (McDowell 1994b: 198)

Following this idea, the subpersonal level of explanation deals only with syntactic processes, whereas the personal level is characterized for the place it gives to explanation in semantic terms. What establishes a direct relation between person and world is meaning and reference. But at the subpersonal level there are no semantics.

The personal level of explanation is characterized for describing relations between a person and her environment: this relation, understood as a semantic relation, constitutes genuine content. But what characterizes this relation? In a word: normativity. According to McDowell, normativity is needed to make sense of the contact that a subject can have with the world: "A normative context is necessary for the idea of being in touch with the world at all" (1994a: iv). The personal level is characterized by the existence of normative relations (of justification, warrant, correctness) among its elements: "The relation between mind and world is normative [...] in this sense: thinking that aims at judgement, or at the fixation of belief, is answerable to the world --to how things are-- for wether or not it is correctly executed" (McDowell 1994a: xii).This normative context is equivalent, for McDowell, to Sellars' (1956) *logical space of reasons.*

For Sellars and McDowell, the space of reasons opposes to the space of laws, the logical space in which natural science's discourse takes place. The difference between both "realms" lies in the kind of relations established between their inhabitants. In the logical space of reasons there are: "relations such as one thing's being warranted, or --for the general case-- correct in the light of

another” (1994a: xv). In this realm, explanation is governed by what Davidson calls "the constitutive ideal of rationality" (Davidson 1980: 183). In virtue of being constituted by elements sensible to reasons, talk within the space of reasons allows talk about freedom and responsibility: “Rational necessitation is not just compatible with freedom, but constitutive of it. In a slogan, the space of reasons is the space of freedom” (McDowell 1994a: 5). Thus, the normative context allows the use of concepts like action, belief, judgment, etc. These concepts involve responsibility and commitment on the part of the person.

In the realm of laws, on the other hand, there is no space for such concepts, because the relations between its inhabitants are not normative. The kind of intelligibility of the phenomena in this space is different from the intelligibility that reasons provide. Sellars holds only a negative characterization of the space of laws, as a space constituted by relations different from the normative relations of the space of reasons (McDowell 1994a: xv). However, the name given can provide a useful insight into the distinction. The nomological, what is bound by laws, does not allow description or explanation in terms of its, as it were, correctness in the light of anything. It only allows description in merely factual terms and is, therefore, excluded from the space of reasons and hence from the personal level of explanation.

What is found in the subpersonal level, to sum up, are phenomena that are not susceptible of an explanation that appeals to normative relations. They are processes that can only be described in terms of syntactic and algorithmic operations. Such algorithmic processes clearly exemplify the kind of nomological phenomena that are outside the space of reasons. At the personal level, on the other hand, explanation is bound by normative constraints, obeys the ideal of rationality, and is characterized by describing relations that are normative (like justification). At the personal level there are descriptions and explanations of the interactions between a rational agent and the world.

Let us return to the tele-assistance model. Ventral-dependent selection of actions can be understood as a personal level phenomenon, since it is a "reason-based selection of actions” (Clark 2001: 512) Processing in the ventral stream:

> subserves an intermediate goal in the guidance of behaviour, specifically the formation of perceptual representations of objects and of their relationships. Such representations are necessary if behaviour is to be guided intelligently by events that have occurred at an earlier time, allowing, for example, a mate or a prey object to be categorized correctly and, thus, acted upon appropriately. (Milner and Goodale 1995: 20)

Firstly, as shown in the passage above, ventral dependent process lead to the formation of *visual representations* of objects and their properties. Secondly, this representations are the base to *act appropriately.* In the case of human beings, Clark holds, this selection is *based on reason*. Such idea of a process based on reason is reminiscent of McDowell's and Sellars' portrayal of phenomena belonging to the space of reasons, as sensitive to normative constraints. If action selection is based on reason, then it calls for a type of explanation that involves normative notions, such as appropriateness, correctness or rationality. Action-selection is rational/correct/justified, etc. by reasons. These reasons include the subject's beliefs and desires but also the contents of her experience. It is in the light of these contents that the selection of an action is rendered rational or appropriate.

Action selection consists in choosing an action type and a target-object and communicating this choice to the brain systems that are able to execute it. For example, based on her perception of her environment, and her desire to make a phone call (besides other intentional states), a subject may select the action: "pick the phone that's placed in front of me", and then go ahead and perform the action. Action selection can be understood as the formation of an intention to act, where "intention" is defined as a mental state whose content (and conditions of satisfaction) is an action to be performed by the subject[27], and that is motivated by other intentional states, as beliefs and desires, that render it appropriate. Thus, when the subject selects the action "pick the phone that's placed in front of me", it may be said that she has the intention to pick up the phone in front of her, and that this intention is executed by means of bodily movements that are guided by visuomotor routines.

Following this line of thought, action-selection, which is a ventral-dependent process, would amount to the formation of an intention. Subjects' intentions would be, in this model, based on the contents of experience (representations of objects) and would themselves have a content (an action to be executed upon a target-object). The idea of a reason-based process entails that the contents of intentions enter in justificatory relations with other contents, like those of beliefs, desires, and experience. Subjects' intentions can be explained as "appropriate" or "rational" in the light of her experience and other mental states. The selection of actions (as well as their explanation) is bound by normative constraints, characteristic of the personal level of explanation. For this reason, it can

[27] For a discussion of intentions, actions and their relation, see: Searle 1983: Chapter 3

be said that the planning of actions can be attributed to the person, and not only to a module of her brain.

On the other hand, the programing processes do not seem to satisfy the criteria of the personal level of explanation. Firstly, Milner and Goodale insist that dorsal processing does not conform a visual representation that is available to the subject. Thus, neither the visual information that enters as input to the sensorimotor routines, nor motor control are accessible to the subject. Both operate, as it were, behind perceptual experience's back. Insofar as the subject does not have access to the information or to the control of the activity it is not easy to see how they could be legitimately attributed to her.

Secondly, programming processes are characterized as executions of sensorimotor routines not unlike the ones carried out by a robot. Routines are automatic and nomological processes that do not call for, nor allow, normative explanations. Their explanation only requires an algorithm that determines the nomological covariation between the detection of visual properties in the environment and a determined range of motor responses. For this reason even if the programming of the actions is framed and triggered by a selection made on the base of reasons, it is not itself sensitive to, nor guided by, reasons. In an algorithmic process, given certain input, there is a guarantee of a particular answer. In this sense, there is no space for freedom or error; notions that are constitutive of the space of reasons. There are no normative constraints in the motor programming explanation, and the regularities it obeys are nomological and algorithmic.

For these reasons, the tele-assistance model entails a dissociation of action in a personal and a subpersonal component.[28] Even though Milner and Goodale only talk explicitly about a distinction between a conscious and an unconscious process, the way they frame this distinction leads to a deeper disassociation. One that involves phenomena of two distinct levels of explanation, each

[28] In a broad sense, every model of intentional action must make use of distinguishable personal and subpersonal elements. An explanation of action that does not include these components would be incomplete. Without an explanation at the personal level, the concept of "intentional action" would lose its meaning. On the other hand, the implementation processes (like the transfer of nervous impulses, etc) require a nomological explanation. In this sense, my claim about the tele-assistance model may seem trivial. However, what I intend to highlight is the point in which Milner and Goodale draw the division between the personal and subpersonal processes. This is the problematic aspect in their model, as I will show in this chapter.

corresponding to the processes involving one of the visual streams.[29] At the personal level there is only the selection of actions and target-objects; that is, the formation of an intention, whose content is a kind of action and an object upon which to perform it (for example: "lift the pen to my right" or "move the chair that is in front of the table"). At the subpersonal level there is motor activity and all the programming and control processes for bodily movements. There is, thus, a conceptual opposition between a deliberate selection of action that is guided by reasons, and an automatic, algorithmic, and nomological process.

I would like to venture a description of the process of performing an intentional action, under the tele-assistance model, in order to clarify what is the role that each of the visual streams plays in this process.[30] Let us take the action of picking up the phone to make a call. In the first place, I must choose an action-type that looks appropriate according to my beliefs and desires. If I desire to make a call and I believe that for doing it I need to use a phone, it is rational to pick up the phone. Secondly, the ventral system must identify an object in the visual field as the target-object. For this, an object must be categorized as "phone" and located within the visual field by determining its position in a system of coordinates based on the scene (say, “on top of the table”). Now I have the intention of picking up the object that’s on the table. Once the object has been identified and located, the ventral system must, as it were, flag it as the target object of the action. An order with the content "Pick up the object at the coordinates x, y, z of the visual field "is then issued and communicated to the brain systems in charge of executing it. The ventral-dependent planning processes stop here.

From this point on, the dorsal system takes charge. It must compute the exact position of the phone in relation to my body or, more specifically, to my hand. It must determine the direction in which I must move my hand and the size, form, grasping points, etc. of the object. As my hand approaches the object, it must determine the appropriate MGA, the correct position of the hand, the appropriate closing of my fingers to make contact with the object, etc. These processes are carried out by algorithms that correlate the detection of a certain property of the object with a particular motor response (detection of a five centimeter wide object with a seven centimeter MGA, say). If the brain

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[29] Perhaps its important to clarify that I do not claim that processes in the ventral system are processes of the personal level of explanation. What is to be found at the personal level is their product: the visual representation of the environment and the selection of actions. The expression "ventral dependent process" is used to stress the dependence of these personal phenomena on ventral processing.

[30] I will not mention the details of the neurophysiological process. For a complete description of the process at this level, see Milner y Goodale 1995, Chapter 7

is working correctly and the environment does not present any obstacle, we can safely assume that the story has a happy ending where I can pick up the phone effortlessly and, why not, without knowing how I did it ---for the routines of visuomotor control are outside the bounds of my experience.

If this story is correct, the dorsal stream has the role of *guiding* the execution of actions. That is, the role of processing, in a very precise manner, the features of the object that are relevant for the skillful performance of the action. We can thus say that the dorsal stream is responsible for guiding the execution process, in order to satisfy the intention in a skillful way. Concerning the planning processes, two objectives can be identified. Firstly, the planning processes must form an intention that is rational in the light of the subject's beliefs, desires and experience; it has the task of specifying an action type and an object upon which it will be executed ("Picking up the phone"). Secondly, send the order to the systems in charge of execution: trigger the causal chain that leads to the execution of the action. According to the tele-assistance model, an intentional action consists in the execution of a series of nomologically determined routines, which are triggered by an intention of the subject that specifies the state of affairs that is sought with the action.

2.1. Objections to the tele-assistance model

On this section I shall argue that the tele-assistance model is not a good model of intentional action. First, I shall present McDowell's critique of theories that disassociate intentional action. Then, I shall present my own argument, developing McDowell's, to determine specifically what are the conceptual problems in disassociating intentional action in the way that the tele-assistance model does.

2.2.1. McDowell and bald naturalism

In the fifth lecture of *Mind and World* (1994a), McDowell criticizes the view of intentional action that stems from the philosophical posture he calls *bald naturalism*. He considers that bald naturalism disassociates action in two components: the intention, an act of spontaneity belonging to the space of reasons and situated within a web of normative relations; and bodily movements, belonging to the space of laws. For this reason, agency (a concept belonging to the space of reasons) is reduced to the formation of an intention and tends to shrink into an *inner realm*, where it

only has the function of framing actions. Bodily movements, then, seem to be mere effects in the subject's body as a result of an intention ---effects that are alien to the subject. (McDowell 1994a: 92-3)

The problem with this explanation of intentional action is that it blurs the tight relation between the intention of a subject and the bodily movements through which it is executed. In this view, the intentions frames a chain of bodily movements and they happen within that same frame. To take the analogy used by McDowell, bodily movements and intentions have a similar relation to that between the falling of a tree and the action of cutting it: an external relation (McDowell 1994a 90). In this case, the person's action (the exercise of agency, so to speak) is limited to cutting the tree, but the way in which it falls does not count as, as it were, something done by the subject; it is only an effect of her actions. There are two distinct though related events.

Bald naturalism's characterization of action is similar: On the one hand, there is a subject's intention that stands within the space of reasons and is the only exercise of spontaneity and activity on the part of the subject (the only exercise of his condition as an *agent*). On the other hand, there is an event within the realm of law, that is externally related to the subject's intention. Furthermore: the event is alien to the subject for she does not play any role in the development of the causal chain, aside from triggering it and providing the frame in which such events happen. As McDowell says: "It comes to seem that what we do, even in those of our actions that we think of as bodily, is at best to direct our wills, as it were from a distance, at changes of state in those alien objects [our bodies]" (McDowell 1994: 91).

There are two aspects of this view of action, to which McDowell's objection may be directed. In the first place, the idea that bodily movements are merely effects of intentions. This view holds that the only thing that distinguishes bodily movements executing an action from other events of the world is the fact that the former are caused by an intentional state of the subject, whereas the latter are not. There is nothing constitutive or intrinsic in bodily movements in virtue of which they make part of an *action* of the subject; only something external can do that job: having an intention as a cause. In the second place, the idea that intentions have the role of giving a specification that frames bodily movements: a state of affairs that is sought through those movements. This specification creates a frame within which different series of movements can take place, and with which the subject has no

direct relation. This view, McDowell claims, eliminates *any authentic understanding of bodily agency*. (1994a: 91).[31]

2.2.2. Responsibility and experience

Within the frame of McDowell's theory, we can say that the problematic disassociation comes from placing bodily action in two different logical spaces: the logical space of laws and the logical space of reasons. Being situated in the space of law, bodily movements split from *agency,* --a phenomenon that belongs to the logical space of reasons. Two central notions to understand the constitution of this logical space are freedom and responsibility.[32] Insofar as a subject's agency in her bodily actions is restricted to the formation of an intention, it can only be said that she is free in and responsible for the *formation of the intention*; not for the execution of the bodily action, for it is in the space of laws and nomological compulsion, in which there cannot be talk about freedom or responsibility.

The following argument seeks to do justice to the intuition that we *perform* the bodily movements that execute an action. In the disassociated view of action sketched above, bodily movements seem to be events alien to the agent; they only have a relation to her in virtue of being caused by an intention. However, we have the intuition that bodily movements are *ours*, insofar as we are agents and we perform those movements. In fact, we say that some of our bodily movements are made by us (for example, the arm movements of a tennis player), while others are not (reflex movements

[31] To dissolve the problems that stem from this view of action, McDowell proposes the same treatment given in his theory to perceptual experience, which can be captured in a variation of a kantian slogan: "Intentions without overt activity are idle, and movements of limbs without concepts are mere happenings, not expressions of agency" (1194a: 89). His proposal consists in treating bodily actions as actualizations of spontaneity in which conceptual capacities are already involved: “Intentional bodily actions are actualizations of our active nature in which conceptual capacities are inextricably implicated” (1994a: 90). McDowell's positive view of actions is further developed in the debate held with Dreyfus in *Inquiry* (2007). In few words, McDowell holds that in performing basic actions we are actualizing practical concepts. Having such practical concepts just is having the bodily ability to perform an action (McDowell 2007b). I find two problems with this view. Firstly, it is not clear in which sense so-called practical concepts are concepts. Secondly, it not clear either what is the role that perceptual experience plays to determine the appropriate way of executing a practical concepts in each specific situation. McDowell's proposal deserves further discussion but it would distract us from the main target of these arguments: the dual visual streams hypothesis.

[32] See McDowell 1994a; Brandom 1979

such as pupil dilation in response to changes in lighting). When we execute an intentional action, we suppose the movements of our body are things *we are doing*. As Matthew Nudds says:

> In acting on an intention, we don't simply find ourselves having done something. If I know how to tie shoelaces then I can carry out an intention to tie them without any further reasoning, but in carrying out my intention I don't just find myself with tied laces [...] In acting our bodies move, but our bodies don't just move: *we* move them (Nudds 2007: 5)

The same idea can be found in the following quote by Kent Bach:

> An action isn't just done --it is done in some way or other, and the agent has something to do with that. Even when a person forms an intention to do something immediately thereby initiating the action, the rest of the action doesn't just happen by itself, riding on the crest of the momentum generated by the intention. The rest of the action has to be performed [...] After all, an action can be performed in different ways, with different degrees of skill, control, effort, and attention. (Bach 1978: 363-4)

The action as a whole is *performed* by the agent. The way in which it is performed is something attributed to the agent and not just an alien process that happens in her body. Assuming that the subject is only the *agent* of the intention, leads to a disassociated understanding of action like the one criticized by McDowell. For this reason, the way that we move in order to execute an action requires an explanation, not only of the physiological mechanisms that produce the movements, but also of such movements as *made by the subject.* In other words, we need an explanation of the totality of the action that makes it intelligible as a phenomenon of the space of reasons. The following argument seeks to develop this intuition further.

A. An intuitive argument

It is a common place in theories concerning the content of experience to use examples of activities exhibiting certain phenomenological features, which seem to provide evidence in favor of a thesis. Here I will present another example of that kind. However, the example I'll bring forth is not meant to highlight phenomenological aspects, but characteristics of the activity that are crucial for our understanding of action. The activity of which I want to talk about is that of surgeons at the moment of operating a patient.

The training of a surgeon consists, *inter alia*, in acquiring the millimetric control of her actions. The success or failure of a surgery greatly depends on the perfect control of her hands' movements up to a high level of precision. An inappropriate movement of the scalpel can lead to a failure of the surgery and, in dramatic cases, to the patient's death. Faced with this kind of failure the surgeon must answer in professional, moral, and legal terms. A patient's death can mean losing her license, lawsuits, economic and reputation costs, etc.

We naturally suppose that the surgeon's actions are visually guided. We think, also, that in a surgery the doctor takes full responsibility over the execution of her actions, even the finer ones. The surgeon taking on this responsibility must assume, at least, that the the visual information guiding her actions is reliable and corresponds to reality, since the success of the operation greatly depends on her visual perception. My contention is that the activity of surgeons involves *epistemic commitment* with visual experience, inasmuch as their movements are visually guided and they are movements for which they must assume responsibility. An epistemic commitment consists in taking a stance toward the content of experience; embracing it as correct. The commitment with experience is epistemic insofar as the subject takes her experience as a way of accessing the world, of knowing it, and allowing her to act in it.

I want to defend the idea that motor activity involves a commitment with the content of experience that is similar to the commitment taken when making a perceptual judgment. I will try to show that the responsibility of a subject over an action entails an epistemic responsibility over the content of the experience that guides the execution of the action. To characterize this kind of commitment I will make use of McDowell's portrayal of perceptual judgments, and I will then explain why it can be said that there is an epistemic commitment with experience in motor activity.

B. Perceptual judgment

Perceptual judgments (and beliefs) are paradigmatic examples of epistemic responsibility taken by a subject by committing to a content of her perceptual experience. I want to initially characterize perceptual judgments (or judgments of experience) using Martha Nussbaum's formulation: "I can accept or embrace the appearance, take it into me as the way things are: in this case it has become my judgment, and that act of acceptance is what judging is" (2004: 191). McDowell (1994a) has a similar idea: a perceptual judgment consists in adopting a content of experience as part of a world-

view. The subject passively receives perceptual contents from the world and, in making a judgement based on experience, actively takes that content as a correct representation of the world. In judgement, the subject *takes experience at face value*; she accepts what experience presents as a feature of the world: "In a particular experience in which one is not misled, what one takes in is that things are thus and so. That things are thus and so is the content of the experience, and it can also be the content of a judgement if the subject decides to take the experience at face value" (McDowell 1994a: 26).

This characterization of the move from experience to perceptual judgment is very similar to the Fregean idea of the advance from entertaining a thought to a judgment.[33] The same content presented in experience is the content of the judgment. The move does not consist in a change of the content but in the subject's actively taking a stance towards the content (i.e. she takes it up as correct or rejects it as incorrect). In the activity of judging, the subject is free of committing, or not, with her experience: "It must be possible to decide whether or not to judge that things are as one's experience represents them to be. How one's experience represents things to be is not under one's control, but it is up to one whether one accepts the appearance or rejects it" (McDowell 1994a: 11).

There is another aspect of the Fregean characterization of judgement that its important to note. According to Frege: "It is the striving for truth that drives us always to advance from the sense to the reference" (1948: 216). What drives us in the advance from grasping a thought to a judgment (that Frege describes as an advance from sense to reference) is the striving for truth. According to this, truth acts like a guide in the formation of a judgment. Judgment aims at truth. It can be said, then, that in forming a judgment the subject takes a stance towards a content that consists in taking it as correct (or incorrect) according to a norm: truth. By adopting a content as true, the subject is thereby committed with it. In perceptual judgement there is an *epistemic commitment* with experience insofar as the subject takes its content as a presentation of the way the world is, and thus takes her experience as a way of access to *know* the world.

Following McDowell, in experience the subject is *passively saddled with content* (1194a: 31). Experience, as a receptive and passive faculty, only receives contents from the world, and the

[33] Frege characterizes the advance from thought to judgment as a the recognition of the truth of a thought that is expressed by the assertoric force of an indicative sentence. The activity of judging, for Frege, consists in an advance from the mere consideration or grasp of a thought to the admission of its truth. In this advance, the content of the thought remains intact, but the subject adopts a stance towards that content that consists in taking it as true. See: Frege 1948; 1956.

subject has no control over what it is given. But in perceptual judgment the content of experience enters completely in the domain of spontaneity, for there is a an active intervention of the subject in taking the content to be correct. The active intervention consists only in taking the content as an aspect of the world; that is, taking it as an accurate representation of reality.

The transition from the domain of receptivity to the domain of spontaneity has an implication for the content taken in the judgment: in this transition, the content begins to make part of a web of contents organized by rational relations. The content of the judgment is, then, sensitive to rational relations with other contents. In this way, the epistemic commitment implicit in the perceptual judgment consists in the subject taking the content as her own, integrating it in a web of normative relations and restrictions in virtue of which the content begins to be part of her *world view*. It can be said, then, that the subject is made epistemically responsible for the content of her experience. The normative relations and restrictions, against which the content of experience that is taken in a judgment must answer, demand that it accurately presents a feature of the world, for it must play the role of being the warrant of the truth of a judgment.

McDowell insists that normative restrictions go hand in hand with freedom and responsibility. Together with freedom, there must be some kind of constraint, so that there is a norm against which to comply; i.e., there must be something to which the commitment is answerable. Adrian Cussins expresses a similar idea:

> The idea of commitment seems to require both freedom and constraint: freedom because making an epistemic commitment entails taking epistemic responsibility, and taking epistemic responsibility requires that subjects be free—that subjects are not compelled—in how they determine their judgements. And the idea of epistemic commitment requires constraint because it requires that one could be wrong, have made a mistake, and so be compelled to withdraw the commitment. In making a commitment there is something to which one is answerable, and that to which one is answerable entails constraint because it may require that the commitment be held or withdrawn. (Cussins 2008: 36)

In perceptual judgments the normative restriction is truth and the activity of judgment is oriented to, and guided by, truth. For this reason, judgments must answer normatively to the way the world is as given in experience and against the subject's belief network: they must readjust in order to preserve truth. On the other hand, insofar as a judgment is something for which the subject is

responsible, there must be freedom in the activity of judging, otherwise, if the subject is compelled by an external force, it is not clear how there could be any epistemic responsibility.

Let us return to the main point: I want to characterize, with McDowell, a perceptual judgment as commitment with the content of experience that consists in taking experience at face value, taking it as accurate, and allowing that it's content to be in rational relations with other contents like judgments and beliefs that, as a whole, make up the subject's worldview. Insofar as adopting a content is a normative exercise of spontaneity, it is an exercise of freedom by the subject and, thus, something over which she is responsible.

C. Commitment in motor action

What similarities are there between judgment and motor activity that justify the claim that motor activity involves responsibility and epistemic commitment as much as judgment? There are some interesting similarities that, at the very least, deserve to be considered.

Following Frege's idea, the act of judging involves a strive for truth that will only be satisfied --in perceptual judgments-- if the content of the experience is accurate. For this reason, in the perceptual judgment the subject is committed with experience, by assuming that it presents the world just as it is. Otherwise the judgment would probably be incorrect. This is what I mean by saying that a person takes epistemic responsibility for her experience.

In motor activity there is no strive for truth, evidently; but there is an analog goal: obtaining the desired state of affairs, as specified by the agent's intention. When we talk about visually guided motor activity we suppose that vision allows the execution of the action to be performed in a skillful way that is attuned to the environment. It could be said, then, that just like truth is the general goal of the activity of judging, the visuomotor control of bodily activity has a similar goal: the skillful obtention of the state of affairs specified by the subject's intention; that is, the satisfaction of the subject's intention by means of skillful bodily movements.[34]

[34] The idea of an overarching goal that acts as a guide for motor activity, in the way that truth is a guide for judgment, is taken from Cussins 2003. Also the idea that there is a normativity that's characteristic of motor activity.

One could intuitively say that the satisfaction of this goal depends, partially, on the subject's correct perception of the environment. Perceptual experience provides the information about the environment needed to guide her movements, and thus obtain the desired goal. The subject can only act skillfully if her experience presents the world in an accurate way. Insofar as the agent chooses a course of activity it is natural to think that she considers that such course will be appropriate for the satisfaction of her intention. In this case, the agent must also take the experience upon which she bases her choice to be accurate. For this reason, in performing a particular action, the subject commits to the correctness of her experience; she acquires an epistemic responsibility, just like when she makes a judgment based on experience.

My hypothesis is that responsibility for bodily movements, like the one taken by the surgeon, entails the adoption of epistemic responsibility for the information guiding those movements. In the case of visually guided actions, being responsible for the movements is also being epistemically responsible for the visual information that guides them. It is the same as with the perceptual judgment. The subject acquires responsibility for the contents of her perceptual judgments and, in doing so, she is thereby committed to the contents of the experience they are based on. She assumes them as correct, for the judgement's truth depends on the correctness of experience. Likewise, the success of motor activity depends on the accuracy of the visual information that guides it. Thus, in performing an activity on the base of visual information, the subject commits to its correctness. But in order to do this, the information must be accessible to the subject. How is this access guaranteed? By perceptual experience: it is necessary that the visual information that guides the movements be in the experience of the subject so that she can take a stance towards it and assume responsibility for the movements based on it.

It could be argued that it is not necessary that experience guides the movements to skillfully obtain the desired state of affairs. The evidence presented by Milner and Goodale shows that visuomotor control can work correctly independently of the accuracy of the subject's experience. The experiments presented in the previous chapter show that success in visuomotor control does not depend on the accuracy of experience. If this is correct, it would follow that there need not be an epistemic commitment with experience in motor activity, for it is not necessary that experience be accurate for the activity of the skillful and successful. In other words, if it is not experience but subpersonal information what guides activity, then it is not necessary that the subject takes

epistemic responsibility for her experience. Success in motor activity can be guaranteed by dorsal processing alone. I will argue against this view in what follows.

When a subject is responsible for her movements, they are situated within a normative context in which some movements are correct or appropriate and others are not. A context defined by what the subject, as it were, *ought to do*, rather than by what she actually does. Take the case of the surgeon: In the performance of a surgery, there will be some movements that lead to its success, and others that lead to failure. This fact traces a normative framework for the movements. Those that lead to failure are incorrect, and those that lead to success are correct. Since the surgeon is responsible for the success or failure of the operation, one might say that she ought to perform the surgery in a manner that leads to success. Hence the movements that lead to success are correct; those are the movements she ought to do. The surgeon is, then, responsible to perform those movements, and not the ones that lead to failure. The performance of the surgery is then framed by this normative context. But for there to be a normative context there need be relations such as *one thing being correct in the light of another* (following McDowell).

What determines what the agent ought to do is that to which motor activity responds to, in a normative sense. So, what determines the movements that a subject *ought to do*? Or, in other words, what is it that renders some movements correct and others incorrect? In the first place, the intention that the subject wants to satisfy through her movements. Movements are correct if they lead to the fulfillment of the intention, and incorrect otherwise. Secondly, the disposition of the environment. In different environments, different movements will be appropriate to skillfully satisfy the intention. Hence, when a subject is responsible for her bodily movements, these should be responsive both to her intentions and to the disposition of the environment.

In making a movement for which the subject takes responsibility, she takes (implicitly, perhaps) the movement as being correct against such frame. But how can the subject know which movement is correct in that frame? First, she must know what are the conditions of satisfaction of her intention; that is, what must happen in the world in order that her intention is satisfied. Second, she must have access to the relevant features of her environment that render some movements as correct. For this it is necessary that she has access to the relevant information about the disposition of the environment, and the way in which the environment's disposition is made available to her is through visual experience. Given these two conditions, the subject is now able to perform actions in a

responsible way. That is, in a way that guarantees (or at least makes more probable) that there will be no failure.

She will, then, perform her movements on the base of these dual normative frame. By doing this, she is thereby committed to the correctness of the information on the basis of which she performs her movements. Therefore, in acting and taking responsibility over a movement, the subject is also taking epistemic responsibility for the experience that guides the movement. If this is correct, the tele-assistance model cannot explain an agent's responsibility for her bodily movements, for it denies that the subject has access to the relevant features of the environment in the light of which movements are rendered correct or incorrect. If there is no such access in experience, then there may be no commitment, hence no normative framework against which the subject settles on a course of motor activity. Attributions of responsibility require such a normative frame.

This argument can be criticized by saying that bodily movements can respond to the disposition of the environment without being guided by experience: through visuomotor routines that establish covariations between detected features of the environment and movements executed. However, if this were to be the case, the movements would not respond *normatively* to the environment's disposition. As I explained above, in the tele-assistance model the visuomotor control processes are carried out at the subpersonal level, in which there are no normative relations but only algorithmic ones; visuomotor routines establish nomological covariations between detected features of the environment and the executing of movements. This covariation, that is subject to laws, impedes an understanding of the movement as *normatively* answering to the way the world is. Remember that the normative frame is needed for the ascription of responsibility; it is needed for the ascription to the *subject* (and not merely a module in the brain).

To clarify this point further, consider the difference between movements done by the subject (those for which the subject is responsible) and reflex movements. The degree to which pupils dilate, for example, is a reflex that responds to the lighting conditions of the environment. There is a reliable nomological covariation between the lighting in the environment and the dilation of the pupils. But this is not a movement that is done by the subject; it is not a movement for which the subject is responsible. This movement is, nonetheless, executed by means of a visuomotor routine that *responds* to the environment. This shows that both, movements made by the agent, and movements she does not make, may be responsive to information about the environment.

It does not seem, then, that the kind of response to the environment provided by visuomotor routines guarantees that the agent is responsible for her movements. It is not possible to distinguish the agent's movements from mere happenings with this resource alone. The way to outline the distinction, I suggest, is that reflexes respond algorithmically to how the world is, while the agent's movements respond to the world normatively.[35] This explanation, however, is out of the reach of the tele-assistance model.

A possible answer from the tele-assistance model would be to draw the difference between reflexes and the agent's movements by claiming that the latter are caused by intentions, whereas the former are not. This is a view proper of causal theories of action, and as such is subject to the well-known flaws pointed out in the literature, like those of deviate causal chains.[36] Consider the following case: a man is at a party and has the intention of talking to an attractive woman. This intention causes a state of arousal in the sympathetic nervous system, which in turn causes his pupils to dilate. Though in this case the pupil dilatation is caused by an intention of the subject, we cannot properly say that the dilatation is performed by him. An explanation of action in terms of intention has two problems: firstly, insofar as causal relations are transitive, there can always be cases like the one just described. Secondly, intentions only give a distal specification of the state of affairs they look to obtain: they frame an action, but within this frame there can be several chains of events. These two points show that intentions underdetermine bodily movements and cannot make the difference between movements of the subject and reflexes.

The tele-assistance model can only explain the responsiveness of bodily movements to features of the environment as an algorithmic, nomological, covariation. This explanation is not sufficient to account for a subject’s responsibility for her bodily movements, nor to distinguish between movements made by the subject from mere reflexes. To account for responsibility a normative frame is required; a frame against which some movements are correct, and some are incorrect. When a subject takes responsibility for her movements, she performs these movements on the base of this normative frame. But for this to be possible, she must have access to information about the relevant features of the environment in virtue of which some movements are correct and some

[35] I will develop this point further in the next chapter.

[36] See Davidson 1980; Searle 1983; Frankfurt 1998

aren't. To deny that this information is accessible in experience (as the tele-assistance model does) entails an impossibility to account for this sort of responsibility.

The second argument in favor of my view (that is not entirely independent of the first) runs as follows: the attribution of responsibility for movements supposes the subject's freedom in their control. If visual control of movements is a merely nomological process happening at a subpersonal level, and in which the agent cannot interfere, there is no space for freedom, and hence no space for responsibility either.

Why does the characterization of visuomotor control as a nomological process entail that the subject is not free and, hence, not responsible? Suppose that the bodily movements of a subject nomologically respond to certain visual features detected in the environment. If, in the course of an action, the dorsal stream receives information about the position of a target-object with relation to the subject's hand, this will cause the hand to move in that direction. This process will be determined by an algorithm, in virtue of which whenever stimulus *x* is received, there will be the corresponding motor response *y*. If this were the case, the subject would not have the possibility of making a different movement: she would not have the possibility of modifying, correcting, or changing the movement of her hand ---the movement would already be determined by the nomological process at the subpersonal level. Furthermore, the subject would not have access to the information needed for such correction.

The contrast I want to present here, between an action for which a subject can be held responsible and one caused by a subpersonal process, can be better understood through the contrast that McDowell presents between justifications and exculpations: "if someone is found in a place from which she has been banished, she is exculpated by the fact that she was deposited there by a tornado. Her arriving there is completely removed from the domain of what she is responsible for; it is not that she is still responsible, but there is a basis for mitigating any sanctions" (McDowell 1994a: 8). According to McDowell, when we deal with *exculpations*, there cannot be ascription of responsibility; for to do so we require the normative frame of justifications.

Consider the example of a surgeon that causes the death of her patient by cutting an important blood vessel by misdirecting the movements of her hand while using the scalpel. If we explain the mistake of the surgeon as a result of an automatic visuomotor routine, the surgeon would be as responsible

for this mistake as the person in McDowell's example. To put in McDowell's terms, when what happens is "the result of an alien force, the causal impact of the world, operating outside the control of our spontaneity." (1194a: 8), the subject cannot be held responsible for it. In these cases, the subject can only be exculpated, but this is exactly the opposite of what we are looking for.

While the information that guides the movements is relegated to the space of subpersonal processes, their success or failure can only be attributed to the visuomotor routines that control them. Freedom presupposes the possibility of abstaining. In perceptual judgment, the subject has the possibility of accepting or rejecting what is presented to her in experience. In motor activity, the subject should also have the possibility of acting on the base of what experience presents her, or abstaining from doing so; she must also have the possibility of correcting an erroneous movement. But in order for this possibility to be available, the information that determines the correctness conditions of the movements must be accessible to the subject. If it is only accessible to a subsystem of her brain that works through routines, the subject will never find herself in a position to follow a course of action that seems correct, or abstaining form doing so. Because the subject has no access to the information that determines the correctness of her movements, she cannot know when a movement being made is appropriate, or when it is not so and should be fixed; her body is nomologically compelled to perform the movements dictated by her dorsal system. The subject is not free to choose, and so, is not responsible for her bodily movements.

It is not part of my hypothesis that we are always fully responsible for each and every one of our movements, or that we explicitly commit with all the visual information that guides our motor activity. What I wish to stress from the surgeon's examples is that there are some cases in which we are fully responsible. The ascription of responsibility in the execution of actions requires that the subject has access to the perceptual contents that guide motor activity. Even if in our daily motor activity we do not explicitly commit with the contents of our experience, the ascription of responsibility over motor activity assumes that we are (at least potentially) able to take epistemic responsibility for the experience that guides it.

In other words, for a situation like that of the surgeons to be possible, a case in which the agent must be responsible for any movement, it is necessary that the agent be epistemically responsible for the visual information that guides her movements. She must have the possibility of intervening in the course of her movements ---either choosing or fixing them--- so that the movements can be

attributed to her and not to an automatic routine in her brain. But it would not be enough that the subject blindly intervened in the course of her movements (certainly a surgeon would not like to operate blindfolded). The intervention has to involve epistemic responsibility for the information that guides it.

The tele-assistance model entails that such ascription of responsibility, like in the case of the surgeons, is not possible. According to this model, the control of bodily movements (once framed and triggered by an intention) is entirely independent of the subject's visual experience. In this model, the movements performed in an action are completely determined by automatic visuomotor routines --- by subpersonal algorithmic processes in which the subject is not involved and there is no sensitivity to reasons. Furthermore: the information relevant for movement guidance is *inaccessible in principle* to the subject's experience.[37] Thus the subject cannot, in principle, take epistemic responsibility for the visual information that guides her movements since she has no access to it. In other words, the tele-assistance model, combined with Milner and Goodale's bold proposal, lead to the impossibility of accounting for an agents responsibility over her bodily movements. In this model, movements will alway be (just like in bald naturalism, according to McDowell) alien to the subject.

2.3 The other side

In the section above, I argued against the disassociated models of intentional action that, like tele-assistance, are not capable of accounting for agents' responsibility over the bodily movements they perform in the course of an action, and are also incapable of distinguishing movements done by the agent from those that aren't. The reason for this explanatory poorness is that movements are situated in what Sellars calls the space of law, where there are no normative relations or restrictions that allow talk about freedom and epistemic responsibility. In this section I will briefly present an alternative version of action and I will argue shortly and shallowly against this view, hoping to explain why it is not a satisfactory alternative.

The explanation of action given exclusively in terms of intentions leaves out an important part of the phenomenon: the way in which we move to execute an intention. As Nudds suggests, the

[37] See: section 1.1. and 2.1

explanation of the particular movements we make is out of the reach of the explanation in terms of intentions:

> In seeking to explain visually guided actions, we are seeking to explain how vision guides the *way* we move in carrying out our intentions [...] I don't have any intentions to move in a specific way. If vision guides my action --guides the way I move-- it must do so in some direct way that is not mediated by intentions [...] Suppose for example that someone intentionally ties their shoelaces. In carrying out their intention to tie them, they perform certain hand movements --they move their hands in just the right way required for shoelace tying. In the same way that we can ask, of someone who performs the visually guided action of picking up a coin, *why* they moved their hand to *that* place or in *that way,* so we can ask why someone moved their hands in *that* way in performing the action of tying their shoelaces (Nudds 2007: 3)

The passage suggests that an explanation of action requires an account of the bodily movements that we perform in the course of an action. The particular way in which we move is not determined by the intention: there can be several different movements that execute the intention of picking up the pen in front of me, all resulting in the obtention of the intention. As McDowell holds (1994a), an intention only frames a course of action. An explanation in terms of my intention necessarily underdetermines the actual course of action performed. This entails problems like the impossibility of distinguishing the agent's movements from mere reflexes.[38]

It is worth asking, then, if it is possible to explain the subject's movements by ascribing her intentions to move in particular ways. Instead of an explanation of action appealing to a distal specification of the intention, there could be an explanation in terms of several intentions with particular bodily movements as their contents. This would avoid the underdetermination and the responsibility-ascription problems: the agent would be responsible for the body movements specified by her intentions, thus justifying the movements (insofar as there is a justification for the intentions). Justification for these intentions would situate bodily movements in the space of reasons, which would render the ascription of responsibility less problematic.

I will call this kind of explanation *intellectualist*, following Merleau Ponty's slogan: "judgment is everywhere pure sensation is not, which is to say everywhere" (2002: 39). This view I am suggesting is intellectualist because it postulates doxastic states and propositional intentions for

[38] See: Section 2.2.

each bodily movement performed by the agent. The slogan could, thus, be adapted as follows: "intention is everywhere pure movements are not, which is to say everywhere". I will not enter in the details of theories defending this kind of explanation, for they are not the main target of my critiques (unlike the tele-assistance model). I will only point out a theoretical orientation, which I will superficial criticize.[39]

The explanation of action in terms of intentions has this general form: it appeals to beliefs and desires of the agent to justify an intention. These kind of explanations show the intention to act as the product of an instrumental practical reasoning: "Given the desire *P* and the belief *Q*, I should act in an *A* manner", where *A* is the content of an intention (in the case of visually guided actions, the beliefs can be perceptual beliefs) If we wanted to explain the bodily movements performed by a subject in terms of intentions, we would have to ascribe her practical reasonings of the kind "Given the desire *P* and the belief *Q*, I must make the movement *A*" for each and every single one of the bodily movements performed in the course of action; that is, the subject should be attributed doxastic states that entered in practical syllogisms to rationalize and justify each and every one of the movements performed.

This explanation model has several undesirable consequences: (1) It would need to postulate an individuation criterion for bodily movements so that it could formulate a practical syllogism for each and every one of them. There may be, however, several difficulties in formulating such a criterion. For example: the anticipatory adjustment of the hand for grasping an object would count as one single movement or as many? I do not want to suggest that it is not possible to establish such criterion but it would probably result in a complicated, artificial taxonomy of bodily movements.

(2) The model would also need to ascribe to the agent as many doxastic states (beliefs, judgments, etc) and practical reasonings as there are movements. In complex actions, involving several simultaneous movements, this would result in an cognitive overload for the agent (Pacherie 2011). This overload can be even more dramatic, if one considers other elements the subject has to include in her practical reasonings, such as constant environmental changes, the need of doing hasty movements in some circumstances, etc.

[39] For an explanation of actions in this line, see: Israel, et al. 1993; and to see a critical interpretation see Pacherie 2011.

(3) The explanation would not do justice to the idea that there are basic actions in our action repertoire: actions whose performance does not require the intervention of instrumental rationality.[40] According to this model, basic actions would be bodily movements, and not object-oriented actions, like "catching a frisbee" or "picking up a fork", which are basic actions *par excellence*. The notion of basic action explains important facts, like the acquisition of practical abilities, like playing tennis, skiing, knitting, etc. The difference between the performance of an novice and an expert is generally explained by saying that for the expert a performed action, or a repertoire of them, is basic, while the novice requires the mediation of instrumental rationality. Skillful performance of actions seems to require the absence of instrumental rationality in its execution.

A dramatic example of this point is that of the baseball player Chuck Knoblauch. After being recognized as an extremely skillful player, he started thinking about the movements he had to perform to throw a ball to first base, after which he lost his ability:

> As second baseman for the New York Yankees, Knoblauch was so successful he was voted best infielder of the year, but one day, rather than simply fielding a hit and throwing the ball to first base, it seems he stepped back and took up a ‘‘free, distanced orientation’’ towards the ball and how he was throwing it—to the mechanics of it, as he put it. After that, he couldn’t recover his former absorption and often—though not always—threw the ball to first base erratically—once into the face of a spectator [...] I’m told that in some replays of such easy throws one could actually see Knoblauch looking with puzzlement at his hand trying to figure out the mechanics of throwing the ball. (Dreyfus 2007a: 354)

Dreyfus presents this case to show that the mediation of rationality inhibits the skillful performance of an action. McDowell (2007b) interprets this case as an example in which instrumental rationality interferes with the bodily skills:

> Knoblauch exemplifies a specific way in which practical intelligence can lose its grip on activity. That can happen when someone with a skill whose exercises belong to a basic action type tries to bring the limb movements that contribute to doing the thing in question within the scope of intention otherwise than under specifications like ‘‘whatever is needed to throw efficiently to first base’’. Before the loss of ability that takes that shape—the attempt to extend the scope of intentional control—the skill itself provided for the movements to be as they needed to be (the skill itself gave specificity to that ‘‘whatever is needed’’), without the agent’s means-end rationality being called on to intervene. This kind

[40] See McDowell 2007b

> of loss of skill comes about when the agent's means-end rationality tries, so to speak, to take over control of the details of her bodily movements, and it cannot do as good a job at that as the skill itself used to do (McDowell 2007b: 367-8)

(4) In an explanation of this kind, the notion of "object-oriented actions" would be disfigured. The content of intentions is typically specified distally, as a state of affairs that the subject seeks to make the case through her action. This specification of the content is one of the reasons for which the action is characterized as *intentional*: it is directed towards the world, towards objects. In the performance of object oriented actions, one might say that the body is "transparent", insofar as it is kept in the background, allowing the intentional object of the action to be the world, not a bodily movement. In the intellectualist view, this transparency is lost, for the contents of intentions are not distal but rather bodily movements. In such model there would not be object-oriented actions but a series of actions oriented to bodily movements (considering that an action is specified by an intention, each movement would be an intentional action in itself) that would finally cause a state of affairs in the world. The state of affairs, however, would stop being constitutive of the action.

What these four criticisms show is that the mediation of instrumental rationality in the execution of bodily action can hinder the action itself (its performance as much as its understanding). It seems that instrumental rationality interferes with motor abilities, instead of being a tool for the selection of optimal courses of activity. This suggests that motor activity does require some degree of *automaticity*. Habits, routines, and predetermined responses have a great value for motor activity (which can have effects in the survival of the individual or the species). This is well-known idea since Hume's *Inquiry*. In evolutionary and engineering terms, some degree of automaticity is a good a idea. However, for the reasons presented in this chapter and others to come in the next one, it seems necessary that these routines be accessible to spontaneity. Spontaneity must be able to take control of what is in most cases automatic and predetermined.

2.4 Conclusions of the chapter

In this chapter I explored the tele-assistance model of intentional action, formulated within the dual visual streams theory. In the second section I showed that, because of the disassociation of intentional action, the model faces serious problems in accounting for the agent's responsibility over her bodily movements.

In the third section I explored an alternative model, that looks to avoid the problems brought by the models that disassociate action: the intellectualist explanation. This explanation is not satisfactory because it puts too much cognitive burden on the agent, while also vanishing the notion of "intentional action" as an action oriented to the world. The problems of this explanation show that automaticity, at least to some degree, is valuable for the success and skill in bodily actions. In the following chapter, I will suggest an alternative model to explain the relation between motor activity and perceptual experience that aims to bring together the importance of automaticity with an explanation of bodily action that allows it to be situated in a normative frame, and thus account for the agent's responsibility for her bodily movements.

Chapter 3
Perception and Activity

In the previous chapter I argued against the model of intentional action presented as part of the dual visual streams theory. This model disassociates action in such a way that generates difficulties in accounting for the responsibility of a subject for her bodily movements.

These problems are the consequence of a narrow understanding of experience. According to Milner and Goodale, the disassociation between perception and visuomotor control is due to the fact that the information processed by the dorsal stream does not have the appropriate, as it were, format to be part of the visual experience of the subject. It does not have the form of contents about objects and invariant properties that are prone to be part of judgments. For this reason, the information in the dorsal stream, containing the relevant features of the environment that render some movements as correct or incorrect, is completely excluded from perceptual experience. This information, being relegated to a brain module, is not available to the subject. Hence it cannot be used *by the subject* to guide her movements. This entails that the task of guiding movements can only be attributed to the automatic processes of sensorimotor routines, and not to the subject. This sheds doubt over the possibility of ascribing the subject responsibility for her bodily moments (for the way she performs an action) beyond the formation of the relevant intentions.

I will suggest that the strategy to avoid the problems surrounding the conception of action is to reformulate the theory about the relation between perception and action. This reformulation must be such that it allows contents in perceptual experience with a non-propositional format. If the understanding of experience is improved in this way, experiential content can be thought of as including information about the conditions of correctness of bodily movements, and this information would be accessible to the subject. Once this access is guaranteed, it will be possible to ascribe the guidance of movements *to the subject*, and responsibility over them will no longer be problematic.

3.1. The glide-path model[41]

In the end of the previous chapter I suggested that, to avoid the diagnosed philosophical problems regarding action, an explanation of the relation between perception and motor activity is needed: an explanation that does not disassociate action and yet does not lead to an intellectualist view. The reasons given in the previous chapter show the conceptual problems faced by a theory that holds that bodily movements are entirely automatic. The objection to the tele-assistance model shows that in the case of responsible action, the possibility for spontaneity to take control of bodily movements is required. The objections to the intellectualist approach, on the other hand, show that instrumental rationality may interfere with skillful action and that automatic routines are valuable tools in the execution of actions: they prevent a cognitive overload on the subject, allow an appropriate time frame for the action, etc.

There are, however, cases in which the automaticity principle has proven to be problematic, even for engineering. There are cases in which a free and intelligent human operator needs to take charge of the situation. One can be found in aeronautic design: The control systems of commercial jets are designed in a way that impedes the plane from flying at certain degrees of inclination. When the plane is inclined beyond a certain degree, its mechanisms are under too much pressure and there is a high risk of damage. For this reason, the plane's computer is programmed to prevent those inclinations in which the plane's mechanisms are endangered. The plane is programmed so that, whatever the pilot does, it is not possible to fly at a slope beyond the range allowed by the computer.

This engineering principle is clearly beneficial, for it protects the plane from human error. In this way there is a guarantee that the flight follows the appropriate course and the plane is not at risk. Insofar as the pilot has no possibility of altering the maximum degree of inclination, there is a *guarantee* that everything goes as it should. But what happens if there is a situation unforeseen by the computer programmers? For example, if the radar is damaged by a storm that also reduces the pilot's visibility, and she is suddenly faced by a mountain that cannot be avoided unless she inclines the plane beyond the degree allowed by the computer. Or if the pilot realizes too late she is going to

[41] This entire section was motivated by my conversations with Adrian Cussins. He was the first to come up with the metaphor of a glide path to explain the relation between perception and action.

crash with another plane and the only way of avoiding the collision is by going outside the predetermined slope range. Such cases are not only possible; they have happened in real life.

These cases show that what is normally a good engineering principle (that typically guarantees the correct functioning of a system or activity) can become disadvantageous in unforeseen conditions. If there is an error that was not considered in the system's programming, the inability of the human operator to intervene can be catastrophic. When possible mistakes are foreseen and there are reliable algorithms to respond to them, automatic routines are a good strategy. The problem is that there cannot be a program with predetermined answers for every possible situation in a course of activity. In these cases of error, an intervention on the part of a free and intelligent agent is needed.

Returning to philosophy: a theory about the relation between perception and motor activity is needed, which includes both automatic routines and the possibility of spontaneity taking control of the movements. The alternative presented by the tele-assistance model is not satisfactory, because of the reasons presented in the second chapter. Spontaneity needs to take part in motor activity itself and not only in the formation of intentions to act. In what follows I will suggest a sketch of a theory that can fulfill the requirements presented throughout this work, to account for the relation between perception and action. This sketch is based on a fundamental notion that is absent in the tele-assistance model; a notion that serves to distinguish between an agent's movements and mere happenings in her body.

3.1.1 Frankfurt and the notion of "guidance"

In his essay "The problem of action" (1998), Harry Frankfurt discusses a central problem in the philosophy of action: "the contrast between what an agent does and what merely happens to him, or between the bodily movements that he makes and those that occur without his making them." (Frankfurt 1998: 69). His discussion begins with a critique of causal theories of action, similar in some respects to the one presented in the second chapter.

Causal theories of action make this distinction based on the causal history of bodily movements: what makes a series of movements an action is their being caused by a certain kind of event (an intention, a desire, etc). According to these theories, the movement's causal antecedents are sufficient to determine if they are to be considered actions or not. In this model, there is nothing

intrinsic to movements that makes them actions; the distinctive feature is external to the movements. As I explained in the previous action, McDowell shows that this understanding of action entails an important problem for the notion of *agency*. Frankfurt has a similar objection:

> It is integral to the causal approach to regard actions and mere happenings as being differentiated by nothing that exists or that is going on at the time those events occur, but by something quite extrinsic to them [...] The result is that it is beyond their scope to stipulate that a person must be in some particular relation to the movements of his body during the period of time in which he is presumed to be performing an action. (Frankfurt 1998: 70)

Frankfurt argues that this feature of causal theories of action makes them particularly liable to counter examples, specially examples of deviate causal chains (1998: 71). More importantly, these theories are incapable of accounting for what, he claims, is one the most fundamental characteristics of action: a certain relation, or contact, that a subject has with her movements during the course of her actions. According to causal theories of action, the subject's relation to the movements of her hand to pick up the phone, *during the course of the action*, is the same relation she has with the dilatation of her pupils. The only difference between these events is the fact that the former is the effect of a certain kind of cause, while the latter is not.[42] This is not only counterintuitive but also entails conceptual problems related to the notion of responsibility, as shown in the previous chapter.

Frankfurt proposes the following criterion for distinguishing between a subject's actions and events that merely happen to her: "What is not merely pertinent but decisive, indeed, is to consider whether or not the movements as they occur are *under the person's guidance.* It is this that determines whether he is performing an action" (Frankfurt 1998: 72). Frankfurt claims that the particular relation between a subject and her bodily movements is that of *guidance*. In guiding her movements, the subject stands in a particular relation with them during their execution; that is, the subject guides her movements *as they are being made*.

The concept of "action", according to this view, is defined as "an intentional movement guided by the agent". This differs from the concept of 'intentional action", which Frankfurt uses to refer to actions that are deliberate and self-conscious: actions that the subject has the intention of doing (Frankfurt 1998: 73). According to this, not every action is intentional:

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[42] See Section 2.2.2

> When a person intends to perform an action, what he intends is that certain intentional movements of his body should occur. When these movements do occur, the person is performing an intentional action. It might be said that he is then guiding the movements of his body in a certain way (thus, he is acting), and that in doing so he is guided by and fulfilling his intention to do just that (thus, he is acting intentionally). There appears to be nothing in the notion of an intentional movement which implies that its occurrence must be intended by the agent, either by way of forethought or by way of self-conscious assent. If this is correct, then actions (i.e., intentional movements) may be performed either intentionally or not. (Frankfurt 1998: 73-74).

According to this, it is possible to separate the concepts of action and intention. Not everything that counts as an action is guided by an intention. Not everything that the agent does counts necessarily as an intentional action. The agent can move her body in a guided way, so that the movement can be seen as an action (i.e., it is attributed to the agent and not to an external process), independently of whether the movements are guided towards the obtention of an intention.

The quote suggests that action can be analyzed in three components: bodily movements, guidance from the agent, and intention. The notion of *action* is to be understood as a movement guided by the agent. The notion of *intentional action*, on the other hand, is to be understood as a movement guided by the agent, who is guided, in turn, by the purpose or intention of obtaining a determined state of affairs.

The difference between a movement that is alien to the subject and an action can be expressed through the following quote:

> Consider the difference between what goes on when a spider moves its legs in making its way along the ground, and what goes on when its legs move in similar patterns and with similar effect because they are manipulated by a boy who has managed to tie strings to them. In the first case the movements are not simply purposive, as the spider's digestive processes doubtless are. They are also attributable to the spider, who makes them. In the second case the same movements occur but they are not made by the spider, to whom they merely happen. (Frankfurt 1998: 78).

It is suggestive that Frankfurt uses the example of a spider. Contrary to a human being, the spider cannot form intentions with propositional content but can nevertheless perform actions.

A human being can perform actions; some of them intentional, some of them not. For a human being the difference between them would be the difference between directing the movements of the

hand to pick up a phone and the movements of the hand when idly tapping your fingers in a distracted way (Frankfurt 1998: 58) In the first case, there is a series of movements guided by the agent and oriented by the deliberate intention of picking up the phone (that obeys the practical reasoning involving the desire to make a call, the belief that to make a call it is necessary to pick up the phone, etc). In the second case, there is a bodily movement that, certainly, is attributed to the subject (unlike the pupils' dilatation) but that not necessarily obeys to an explicit and deliberate intention formed by the subject.

Thus, the fundamental notion in the explanation of action is no longer the notion of 'intention' but that of 'guidance'. Intention is an additional notion that characterizes a particular kind of actions. According to Frankfurt's proposal, there is a relation between an agent and her bodily movements that is not restricted to causing and framing them by means of an intention. Bodily movements, in this view, can be seen as an exercise of agency on the part of the subject and not as events alien to her.

The notion of guidance for conduct is defined as follows: "Behavior is purposive when its course is subject to adjustments which compensate for the effects of forces which would otherwise interfere with the course of the behavior "(Frankfurt 1998: 74). It is important to distinguish “movements guided by the subject” from “movements guided by a purpose”. For example, pupil dilation is guided by a purpose, but not guided by the subject. We do not say that a person dilates her pupils; rather, we say that they dilate in response to changes in the lighting conditions. In the case of the pupils' dilatation, there are mechanisms that adjust the movements in a way that guarantees fulfilling the purpose. But the movements' guide is attributed to the sympathetic nervous system, and not to the person: “the activity of such a mechanism is normally not, of course, guided by us. Rather it is, when we are performing an action, our guidance of our behavior” (Frankfurt 1998: 75). According to this idea, a bodily movement is intentional (i.e., an action) when the *subject* is responsible for guiding the course of the movements.

The notion of "behavior guidance" is defined as follows: if there were a movement that deviated the course of action from its purpose, the subject would intervene in such course to compensate the deviation. In other words, the subject guides the movements if and only if, in case of receiving negative feedback, she would intervene in the course of action to compensate the deviations that could affect the obtention of the purpose (Frankfurt 1998: 75-76). According to this understanding,

the subject has a regulatory role in the performance of his actions: "What counts is that he was prepared to intervene if necessary, and that he was in a position to do so more or less effectively" (Frankfurt 1998: 75)

This presents a great advantage in comparison to other theories we have encountered so far, for it avoids the conceptual problems of the tele-assistance model, while also avoiding the intellectualist view according to which the subject *chooses* her bodily movements (as a rational choice, the product of deliberation, etc). The alternative presented now allows many of the movements in the course of an action to be caused and selected by automatic routines; however, it also distinguishes between movements made by the subject and reflexes: the former are guided by the subject, while the latter are not.

3.1.2 Some consequences of Frankfurt's view

What does it mean for a movement to be guided *by the subject*? How are we to characterize the sort of guidance that can be attributed to the person and not to some subpersonal mechanism? Since this notion is not further developed in Frankfurt's essay, from now on I will present my own version of this model, based on Frankfurt's view. As stated in the previous chapter[43], what is legitimately attributed to the person (understood as a rational agent) is what stands in the personal level of explanation. The personal level of description has been characterized as one in which normative explanation makes sense. Thus, it the subject's guidance of her movements responds not (only) to nomological relations to visual stimulus, but also to normative restrictions like 'movement *x* is appropriate in the situation *a*, while movement *y* is not'. The movements guided by the subject are those that *normatively* answer to perceptual feedback: movements that adjust to a normative restriction determining how they *should be*.

A consequence of Frankfurt's view is that if we ascribe a particular movement to a subject (i.e., if we admit that a movement is part of the subject's action), we suppose that the subject must be in a position to receive normative feedback to determine if the movement is appropriate, or if it deviates from the behavior in course. If the subject does not receive this feedback, she would not be in a position to compensate for deviations, were there any.

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[43] See Section 2.1.1

To guide a series of movements, the subject must have an idea of which are the appropriate movements for the obtention of her intention. This knowledge must come from two sources: (1) An understanding of the action performed, perhaps given in terms of the satisfaction conditions of the intention: "What is it to pick up a phone?", "What are the conditions under which the intention of picking up the phone is satisfied?", etc.; and (2) the disposition of the environment: in a particular environment, a series of movements can be appropriate for performing an action, and in another they may not be. Because the environment is presented to the subject in experience, we will say that experience is the second source of access to the correctness conditions of the movements. Thus: the subject's guidance consists in monitoring the performed movements, in such a way that they are appropriate for obtaining the desired intention in a particular environment.

In normal cases, these two informational sources are integrated in a common framework: experience. In experience the subject is presented with the disposition of her current environment, in virtue of which some movements are appropriate. But experience is also the base on which the subject forms her intentions. She forms the intention of picking up the phone based on her beliefs, desires, and her experience of the phone in the vicinity of her body. The movements leading to the fulfillment of the intention are, also, based in the experience of the phone (its location, size, etc). This allows an integration of the subject's intention and her guidance of bodily movements. To put it in Frankfurt's terms: this allows the subject to be guided by her intention when she is guiding her bodily movements. When the subject performs non-intentional actions, there is no integration with intention because there is no intention to do the guiding.

Frankfurt's criterion to distinguish actions from happenings leads to a claim about the role that perceptual experience plays in motor activity, even though Frankfurt does not express the point in this way. This theory of action requires a theory of the content of experience in which experience provides the subject with normative feedback on her bodily movements; a theory of experience that accounts for the possibility of movements being appropriate or inappropriate based on the disposition of the environment.

3.1.3 "Glide-Path"

To illustrate the model of the relation between perceptual experience and motor activity, I will use a concept of aeronautic engineering: the notion of *glide path* (in the following GP). When a plane is

going to land, a gliding path between it and its runway is traced: this shows the pilot the trajectory she should follow to successfully land and not run any risks. This path shows the plane's slope, the direction it should follow, etc. When the pilot goes out of the traced glide path, alarm systems activate in the cabin to alert the pilot of the error and ask for a correction of the course.

According to my proposal, when a subject performs an action, experience plays a dual role. On the one hand, it plays the role that the tele-assistance model ascribes to it: being the base for the formation of intentions. On the other hand it has the role of being a glide path for the execution of the action. Experience presents the subject with the course that her movements *should follow* in a particular environment. Thus, experience constitutes a normative framework for the guidance of bodily movements. How is this normative framework constituted?

The version of the model that I want to suggest holds that experience constitutes a normative framework for motor activity insofar as it provides the subject with the normative feedback of the course of her movements. When the movements go out of course, experience provides negative feedback to the subject that allows her to correct their course and compensate for deviations. Experience presents movements as *incorrect* in the light of the agent's intention and her current environment. This feedback is part of the content of experience, it shows the subject what are the appropriate movements to make in a particular environment. To make sense of this, it is necessary to reformulate the view of perceptual experience in the way that I will suggest in the next section.

3.2 The wide view of perceptual experience

Milner and Goodale hold that there are some features of objects that determine what movements must be done, for example, to pick up an object, lift it, etc. Features like the position of the object in relation to the subject's hand, its size, its form, the texture of its surface, etc. All of these features are processed by the dorsal stream to guarantee the success of visuomotor control, and are not presented to the subject in perceptual experience. In the model I am suggesting, experience presents the subject with the relevant features of objects and the environment that render movements as correct or incorrect. On the base of this contents of experience, subjects are able to guide their bodily movements when they perform actions. Dorsal-processing is, accordingly, an enabling

condition[44] for experience to have contents that are useful for the guidance of motor activity, in the same sense that the processing of perceptual constancies is the ventral stream is an enabling condition for the perception of particular objects.

To adopt a model of action like the one suggested in the previous section, it is necessary to abandon some of the ideas that are central to the dual visual streams theory. It is important to clarify which of them should be kept and which should be abandoned. Let us start with the ones to keep:

> (1) Perceptual and visuomotor tasks have different computational requirements and are performed by different systems in the brain.[45]
>
> (2) Success in any of these two tasks is independent from success in the other.
>
> (3) The specialization of the ventral and dorsal systems obeys to the different requirements of each of these kinds of tasks.

The reason for maintaining these theses is the strength of the evidence presented by the authors, so long it is understood in the moderate way that I have suggested. The claims that I want to reject are the following (including also several consequences that follow from them, and that I will not mention):

> (4) The contents of experience are only the conceptualizable contents, susceptible of being articulated in judgments.
>
> (5) Perceptual experience is exclusively the product of the ventral processing.
>
> (6) The information that guides visuomotor control is outside the subject's access.
>
> (7) The execution and programming of bodily actions are subpersonal processes in which the agent has no role.

In the model I am sketching, from the rejection of thesis (4), the rejection of theses (5) -(7) naturally follows. In the following sections, I will present an alternative view of experiential content that denies (4), and then explain how this view interacts with the GP Model, thereby denying (5)-(7)

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[44] See: McDowell 1994b

[45] It should not be forgotten that by 'perceptual tasks' I mean those tasks that involve the report or use of perceptual judgments.

3.2.1 Two kinds of experiential content

Let us go back to Milner and Goodale's argument from the computational requirements of perceptual and visuomotor tasks.[46] One of the most relevant premises for holding their hypothesis is that each task requires a particular kind of processing of visual information:

> Visual processing in perception and action are very different. They differ in their time constants: very short for action, indefinitely long for perception.The two systems differ also in their metrics: one is object-based and relational, the other is viewpoint-dependent and uses real-world metrics. And one system is knowledge based and top-down, while the other works from the optic array using first principles, in a bottom-up way. (Milner and Goodale 2004: 96)

Perceptual tasks involve abilities of recognition, discrimination, and categorization; for these the computation of the invariant properties of objects and perceptual constancies is required. This demands a link with short and long term memory, the processing of relative metric, and a spatial codification that is based on the scene. Visuomotor tasks require, on the contrary, a constant update of the position of the objects relative to the subjects body and a codification of the objects's real size in an absolute metric.

These computational requirements can be understood as the enabling conditions for the execution and success of each kind of task. It is in virtue of the brain's ability to perform these computations in an effective manner that it is possible to carry out each task successfully. To accomplish this, Milner and Goodale argue, it is necessary that the computations be made by independent brain systems; otherwise they would interfere with each other: “These two broad objectives [...] impose such conflicting requirements on the brain that to deal with them within a single unitary visual system would present a computational nightmare” (Milner and Goodale 2004: 73). This is one of their main reasons for stating the functional division between vision for perception and vision for action.

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[46] See: section 1.1

Accepting this argument amounts to accepting theses (1)-(3). The enabling conditions (at the neurophysiological and computational level) of perceptual and visuomotor tasks are different and independent. This argument, presented by Milner and Goodale as a consideration about the engineering level of the processes, is also recognized in philosophical reflections about perceptual experience. Even though there are several formulations of this point, I will try to put it in the most general form: What is needed for experience to justify beliefs and judgments, is very different from what is needed for experience to play a guiding role in motor activity. Some paradigmatic arguments defending this idea can be found in Dreyfus (2007a), Nudds (2007) and Cussins (2003; 2008). Below, I will briefly present Nudds' and Cussins' proposals.

Andy Clark (2001) equally recognizes this point, when he draws philosophical conclusions from Milner and Goodale's theory. He claims that "[t]he contents of conscious visual experience are, on this story, entirely and profoundly concept-ready. And what this costs them is their ability to play a direct role in the online support of fluent, object-engaged behavior" (Clark 2001: 514). So apparently there is a dissociation between the contents that can enter in conceptual thought, justify judgments, etc., and the contents that have the appropriate format to guide motor activity. In light of these considerations, it is natural to think that if we are to give a role to experience in guiding the execution of actions and bodily movements, we would need to postulate a kind of content, different from the propositional-conceptual content. This amounts to rejecting thesis (4).

Thus, a possible reinterpretation of the dual visual stream hypothesis would be that the two streams compute two different kinds of contents for visual experience. The formulation would be the following: each of the streams contributes to the formation of a kind of content of visual experience. The ventral stream and its characteristic mode of processing enable the formation of contents that can be articulated propositionally and form part judgements and reports. The dorsal stream and its characteristic mode of processing enable the formation of a kind of content directly linked with motor activity: a kind of content that allows the subject to guide and regulate her movements during the execution of actions.

This reinterpretation is compatible with a minimal reading of the empirical evidence presented by Milner and Goodale, as I will show below.[47] In this minimal reading,[48] there is a double disassociation between the formation of perceptual judgments and the visuomotor control of action. This interpretation differs from Milner and Goodale's, because it does not deny that visuomotor control depends on the visual experience of the subject.

3.2.2 The wide view of experience and the GP model

At this point, I want to clarify that the goal of this work is not to formulate and defend a particular theory about the contents of perceptual experience. The goal would be better described as the formulation of the *desiderata* for a theory of the content of experience, in accordance with the considerations about the relation between perception and action, that have been presented throughout the thesis. What I have called the wide view of experience is no more than the sketch of the points that should be included in a theory of experience in order to account for the (equally sketchy) understanding of intentional action described above.

The starting point of this proposal is Frankfurt's criterion to distinguish a subject's actions and the bodily movements that are alien to her. This criterion is that the subject guides her movements as they are being made. In section 3.1 I claimed that, in order to be able to guide her movements, the subject must have access to negative feedback: there must be something that presents the movements to the subject as incorrect in the light of the disposition of the environment. If the information that determines the correctness of a movement is not available in experience to the subject, but only to a module in the brain, it cannot be said that the subject is the one guiding the movement. Rather, it would be the brain module doing the guidance. The narrow view of experience involved in the dual visual stream hypothesis is inappropriate for this model, because it denies that the features of objects relevant to guide movements are available in experience. The wide view of experience, suggested here, admits that experience has non-propositional, and non-conceptual, contents that present the subject with the normative frame for her bodily movements. Among the theories of non-conceptual content, there are two candidates that could constitute a wide view of experience satisfying the *desiderata* established here.

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[47] See Chapter 4

[48] See Chapter 1

One alternative is Matthew Nudds' (2007) theory, according to which experience has *presentational* contents, on the one hand, and *directive* contents, on the other. The first kind of contents present the world "as being a certain way", and can be the base for perceptual judgments (Nudds 2007: 11). The second kind of contents do not present properties of the world, but present the way in which the subject must perform her actions and movements. According to Nudds, the subject knows how to move in order to perform an action on an object, in virtue of her perceptual experience of the object. Visual experience guides movements, because it presents the subject with the way her movements should be made; it contributes to the constitution of a guide for motor activity. These visual contents are not presentational, for such contents are useless in the determination of the correct movements for the performance of an action: "Being aware of an object as being some way could only determine an action in the context of a piece of practical reasoning: you are aware of an object as being some way and, given that, have to work out how to move in order to achieve your goal [...] there's no direct move from being aware of an object as being some way to the way you ought to move in order to act on it" (Nudds 2007: 12-3). The visual content that is useful for guiding is the directive content that directly shows the subject how she should move (Nudds 2007: 11).

Another alternative is Adrian Cussins' (2003; 2008) theory, that postulates a similar dichotomy between the contents of experience. Cussins claims that *mediational* (non-conceptual) content differs from *referential* (conceptual) content in two features: its governing normativity and its mode of presentation. Referential content is governed by the normativity of truth. This is cashed out as follows: referential contents, are the contents of thought, judgment, belief and other mental states whose content can be specified by means of propositions. Adopting a Fregean framework, Cussins conceives propositions and thoughts as contents that can be evaluated in terms of their truth or falsehood. In other words, the standard for the correctness of these contents is truth, and so they are governed by this norm; they aim at being true (Cussins 2003: 152). The governing normativity of a type of content determines a mode of presentation of the world given in that content. Referential content is governed by truth, and so it presents the world as that which makes the content true or false. Referential content presents the world as a field of referents: truth-makers (Cussins 2003: 152).

Mediational content, on the other hand, answers to what Cussins calls *mundane normativity*: the normativity of fluent and skillful motor action. Bodily movements in an environment have

conditions of correctness: they can be done in way that is attuned to, and harmonious with, the environment; or they can be done clumsily and incompetently (Cussins 2003: 154). These correctness conditions constitute the normativity that governs mediational content. Consequently, mediational content is not truth-evaluable, but rather is answerable to this standard of fluent, skillful activity. In Cussins' theory, it follows that mediational content has a characteristic mode of presentation of the world. It presents the world as a field of mediation for activity, a field of affordances, solicitations, obstacles, etc. (Cussins 2003: 155).

Mediational content is not only non-conceptual, but also non-conceptualizable, insofar as it is not a kind of content that can be specified in terms of truth-conditions, and its characteristic mode of presentation is not that of referents. In other words, mediational contents are not the type of contents that can be part of judgments and beliefs, because their normative conditions and mode of presentation differ from those of judgments and beliefs. This point is made clear by Cussins' example of the skilled motorcyclist.

> Many years ago I used to ride a motorcycle around London and I would often exceed the speed limit. One time a policeman stopped me and asked, "Do you know how fast you were traveling?" He didn't mean it to be a difficult question; really just a preamble to his telling me how fast I was going. But, lost inside my full-face motorcycle helmet, it dawned on me that this was in fact a difficult philosophical question. On the one hand, I did know, and know very well, how fast I was traveling. I was knowingly making micro-adjustments of my speed all the time in response to changing road conditions. [...] On the other hand, I did not know how fast I was traveling in the sense of the question intended by the policeman. I was unable to state my speed, in an epistemically responsible way, as some number of miles per hour […] My knowledge of my speed wasn't structured in that kind of way. (Cussins 2003: 150)

The speed at which he was traveling was presented to him as a guidance for his movements and adjustments of his body, but not as something which could be judged. That is, not as a propositional knowledge about his speed, which he could judge as true. Still, "[t]hese micro-adjustments weren't simply behaviors, the outputs of some unknown causal process. They were, instead, epistemically sensitive adjustments made by me, and for which I was as epistemically responsible as I was for my judgments" (Cussins 2003: 150). This epistemic responsibility over his movements implies that they were not guided by subpersonal, unconscious processes (as EBS and tele-assistance would claim) but they were guided by personal-level conscious experience.

According to Cussins what makes mediational content apt for the guidance of motor activity is the fact that it shares its correctness conditions. In fact, the governing normativity of mediational content is inherited from the governing normativity of skillful activity (Cussins 2003: 156). Mediational content can guide motor activity because it presents subjects with a field for action, in which some movements are presented as correct and some as incorrect.

Cussins uses an example that is specially useful in this discussion: In going across an unknown room, an agent is guided by the disposition of the objects in the room. Such disposition is presented to the subject as a guide for her activity of walking across the room; that is, it presents the room in a way that shows the subject which are the fluid, skillful courses of action. This form of guidance for movements has a normative character. There are some appropriate courses of activity and some inappropriate; some movements are skillful and some others are clumsy. Cussins holds that this form of guide is not given by the intention of the subject to go across the room: "The normativity that guides your activity is not given by your intention because even if you have one—and you may not— there is also a structure to your activity which would be the same whatever was your intention" (Cussins 2008: 25). To repeat an idea that has been present in this and the previous chapter: the intention does not determine the totality of motor activity, although it may provide an additional guide to the agent. It is meditational content, as such, what guides motor activity; the subject's experience of the environment, affording certain courses of action and inhibiting others.

Although Cussins' and Nudd's theories have strong disagreements, they have some common ground. Firstly, they both claim that propositional content is not enough to guide motor activity. Such content, is (only) useful to form intentions. From intentions on, though, there is much to be done: the correct movements in the environment must be determined, and the subject's movements must be guided to conform to such conditions, and thus successfully fulfill the subject's intention. Propositional content does not have the appropriate structure for this task.

Secondly, both agree in the idea that non-conceptual content (be it directive or meditational) provides the agent with a sort of knowledge of how she should move in her current environment. This knowledge is not propositionally articulated; rather the subject has direct access, in her experience, to the features of the environment that show her how to move. The subject *sees* how to move: she sees the environment and the object as affording certain courses of activity. This

knowledge is a normative frame for the agent's motor activity: it allows her to see when the course of action is in the right path and when there are deviations and errors.

The way in which it is possible for experience to constitute a normative frame for movements is that it presents the environment of the agent as a field of activity in which some movements are correct while others are not. If the subject's experience presents her some courses of action as correct, she can guide her movements on the basis of that experience, taking an attitude of commitment toward it. Letting herself be guided by the non-conceptual contents of her experience is taking epistemic responsibility for its contents.

In tracing normative frames for movements, non-conceptual content performs two roles simultaneously: it provides the subject with the negative feedback needed for guiding her movements, and, while the subject does not receive negative feedback, she will know that she is in the right course and there is no correction needed. She will know that her movements are appropriate in the light of the normative frame traced by experience and that, were her movements incorrect, experience would reveal them to be so. In this way there is a commitment with the experience that guides her movements. Insofar as such contents are accessible and the subject guides her movements by them, she takes epistemic responsibility for them.

This leaves us with an outline of a theory of the content of perception. Sketching these aspects allows a further exploration of the alternatives available, with their problems and advantages. The hardest part of the investigation is still to be done. Firstly, we need a theory that can account for the intimate relation between perception and motor activity, and explain how the two kinds of contents integrate.

Secondly, we need a further explanation of the notion of *normativity* at the non-conceptual level of motor activity. I have adopted a formulation of normative relations found in McDowell: "relations such as one thing's being warranted, or --for the general case-- correct in the light of another" (1994a: xv). At first sight, this is a wide enough description, according to which movements and non-conceptual contents could also stand in normative relations to each other. But McDowell himself denies that this kind of relations can be found outside the realm of concepts (1994a: 5). To support the view that I have here suggested, an explanation and development of the notion of normativity is needed. A possible path to take is to start with the notion of motivation and

normativity used in some branches of phenomenology, such as Merleau-Ponty's and his followers. But this is the topic of further investigations.

3.3. Conclusions of the chapter

In the dual visual streams theory there are two intertwined theses: the narrow view of perceptual experience and the tele-assistance model of intentional action. In this chapter I have proposed a model of the perception-action relation that presents alternatives to both theses: the wide view of perceptual experience and the glide path model of action. The model of action that I propose has the advantage of explaining how a bodily movement can *belong to a subject,* in the sense of being *made by her*, and not merely something happening in her body. This accounts for the responsibility of the subject over the bodily movements she makes in the course of her actions. Assuming the principle I presented in the second chapter, according to which the responsibility over a movement entails epistemic responsibility over the information that guides it, accepting the Glide Path model (GP) would require a broader understanding of experience in which there are experiential contents that present the subject with useful and relevant feedback for guiding her movements in tune with the environment. For this reason, the GP model goes hand in hand with the wide view of experience in which there are two kinds of contents in perception: a propositional content, that provides the basis for the formulation of experiential judgments and intentions, and a sort of non-conceptual content that presents to the subject the normative feedback for the guidance of bodily movements.

I presented, shortly, two theories of the non-conceptual content of experience that could satisfy the *desiderata* established in this investigation: Matthew Nudds's theory of directive content and Adrian Cussins's theory of meditational content. I did not explore the differences between these theories, nor the possible advantages that each could have over the other one. That task is left for another time. However, the common aspects of the theories help as a starting point for the formulation of an outline of a theory of experience that can explain the central role that perceptual experience plays in motor activity, and the way in which an agent is responsible for her movements (by being epistemically responsible for the information used to guide them).

Chapter 4
Objections to the GP Model and the Wide View of Experience

In the previous chapter I presented a model of the relation between action and perception. In the first place, I presented a model of action that seeks to avoid conceptual difficulties within the tele-assistance model: the glide-path model. This way of conceiving action goes hand in hand with a certain view of perceptual experience: the wide view of experience. I suggested these two elements could constitute a view of the relation between experience and action that avoids the conceptual problems entailed by Milner and Goodale's model. In this chapter I will defend the model from two angles: first, I'll defend it from two philosophical objections; second, I'll show that it is consistent with the empirical evidence put forward by Milner and Goodale.

4.1 The philosophical front

One of the conclusions obtained from arguments developed in previous chapters was the need to abandon the narrow view of experience, adopted by the dual visual stream hypothesis, which leads to severe conceptual difficulties. The points I've held in my discussion assume that this conception derives from slightly arbitrary criteria used to ascribe perceptual experiences to a subject in experimental conditions. Nonetheless, there are strong philosophical reasons to adopt this view. In this section I'll examine the argument put forward by Andy Clark (2001; 2007; 2009) in support of a narrow view of experience (defending his claims from some objections similar to the ones I have put forward), to evaluate more clearly its philosophical advantages and disadvantages.

4.1.1 Against non-conceptual content

In his 2001 article, Clark argues against theories that postulate a content of perceptual experience that is specified through its role in guiding motor activity. In other words, theories that claim that there is a direct link between perception and motor activity, and that this link is given by the non-conceptual content of experience.

Clark describes his target-theories in the following way:

> [I]n several influential treatments (Evans, Peacocke, Cussins), a notion of the nonconceptual content of conscious perceptual experience is, prima facie, being required to

> play a dual role: to reflect, on the one hand, the nature and grain of our conscious experience; and to make intimate contact, on the other hand, with the ongoing control of motor activity. What holds these two strands together is the perfectly commonsensical (but potentially false) Assumption of Experience-Based Control. This assumption thus plays a special role in attempts to legitimate a notion of nonconceptual content (Clark 2001: 499)

Clark claims that the notion of non-conceptual content has two roles: (1) account for the fineness of grain and richness of detail of our perceptual experience; and (2) provide a direct link with motor activity. According to this article, the main motivation to put forward some kind of non-conceptual content is the need to account for the fineness of grain of experience, which don't seem to be captured by our conceptual repertoire. The link with motor activity is the result of the need to establish criteria for the fixation of non-conceptual contents (Clark 2001: 496-7). He claims that these two features of non-conceptual content are held together by EBC:

> Assumption of Experience-Based Control (EBC): Conscious visual experience presents the world to the subject in a richly textured way, a way that presents fine detail (detail that may, perhaps, exceed our conceptual or propositional grasp) and that is, in virtue of this richness, especially apt for, and typically utilized in, the control and guidance of fine-tuned, real-world activity. (Clark 2001: 496)

The formulation of EBC deserves some close attention. Clark claims that EBC plays a central role in the legitimation of the notion of non-conceptual content, insofar as it creates a connection between the two roles for non-conceptual content, and thus keeps both strands together. According to his formulation of EBC, it is *because* the non-conceptual content of experience presents the world in fine detail that it is apt to play a role in the guidance of motor activity.

Clark quotes empirical evidence from Milner and Goodale's theory to argue against EBC. He maintains that this evidence proves that motor control isn't guided by the contents of conscious visual experience, but by unconscious information processed in the dorsal stream: "The apparently fine detail […] of our conscious visual awareness is not, if this is correct, the ongoing driving force behind our successful object-oriented manipulations" (Clark 2001: 511). According to Clark, as long as empirical evidence refutes EBC, it also refutes the theories that try to establish a direct link between perceptual experience and the control of motor activity. In place of EBC, Clark proposes EBS[49] as a hypothesis to explain the link between experience and action. EBS establishes an

[49] See Sections 1.1 and 2.1

indirect link between the contents of experience and the guidance motor activity (a link that, as I explained in Chapter 2, can be understood through the tele-assistance model).

Although Clark doesn't claim that Milner and Goodale's hypothesis, and EBS imply a conceptualist view of experience, he considers that they provide support for this kind of views (2001: 516-7): "Where the friends of nonconceptual content aligned visual experience and visuomotor action, and kept these distinct from conceptual reason, EBS thus invites us to align conscious visual experience and conceptual reason, and to keep these distinct from visuomotor action" (Clark 2001: 514). EBS doesn't necessarily imply this conception, since it is consistent with some notions of non-conceptual content, such as Peacocke's and certain interpretations of Evans'; but since none of these notions establishes a guiding link between experience and motor activity, they can't fulfill the role that, I've argued, non-conceptual content must play.

Hence it would seem Milner and Goodale's theory contradicts any effort to assign a type of content to experience that has a direct link with motor activity and can be used as a guide to execute actions. Nonetheless, several important points should be kept in mind. In the first place, Clark criticizes a particular notion of non-conceptual content. According to this notion, it is the fineness of grain and richness of detail of experience that guide activity. What the dual hypothesis shows is that the high degree of detail in visual experience is totally useless in guiding motor activity, since the kind of information required by visuomotor control is different in kind from the information contained in the subject's perceptual contents. Evidence shows, especially in cases of optical ataxia, that preserving details of visual experience is not enough to guarantee successful visuomotor control. The cases of visual form agnosia and blindsight show that it is possible to have successful visuomotor control, even without possessing the typical richness of detail of experience.

But this notion of non-conceptual content disfigures some of the proposals mentioned by Andy Clark; specifically, Adrian Cussins' (2003) proposal. Moreover, Clark's portrayal of theories of non-conceptual content is tendentious, insofar as it makes the theories liable to his objections. In what follows I'll explain why. Clark criticizes theories of non-conceptual content based on the assumption that, according to these theories, it is the fineness of grain and the richness of detail of our experience that make it appropriate for the control and guidance of motor activity. There is, however, a known flaw in the arguments for non-conceptual content that appeal to the fineness of grain of perceptual experience. This flaw is well described by McDowell in the third lecture of

Mind and World (1994). McDowell objects to Evans' argument, which can be stated as follows: our experience has a fineness of grain and richness of detail that exceeds by far the scope of our conceptual repertoire. We don't have enough concepts to capture all the contents that we are able to discriminate in experience, since concepts are coarser grained than our perceptual discriminative capacities. This is evident with the case of shades of color. We have a limited stock of color concepts, although we are capable of perceiving and discriminating shades of color with a high determinacy of detail. Evans takes this as evidence for his claim that experiential content is non-conceptual:

> No account of what it is to be in a non-conceptual state can be given in terms of dispositions to exercise concepts unless those concepts are assumed to be endlessly fine-grained; and does this make sense? Do we really understand the proposal that we have as many color concepts as there are shades of color that we can sensibly discriminate? (Evans 1982: 229)

McDowell responds to this claim by arguing that, even if the premise of the argument is granted, the conclusion does not follow. The reason is simple: although we may not have as many color-concepts as shades of color in our experience, those contents can be captured by demonstrative concepts, such as "that shade".

> It is possible to acquire the concept of a shade of color, and most of us have done so. Why not say that one is thereby equipped to embrace shades of color within one's conceptual thinking with the very same determinateness with which they are presented in one's visual experience, so that one's solar concepts can capture colors no less sharply than one's experience presents them? In the throes of an experience of the kind that putatively transcends one's conceptual powers --an experience that *ex hypotesi* affords a suitable sample-- one can give linguistic expression to a concept that is exactly as fine-grained as the experience by uttering a phrase like "that shade", in which the demonstrative exploits the presence of the sample (McDowell 1994: 57).

Thus, even if the contents of experience are not already conceptualized, they are clearly conceptualizable, or concept-ready.[50] If the fineness of grain and determinacy of detail of perceptual experience can be captured by demonstrative concepts, and if they can be articulated in demonstrative thoughts, then they can also be articulated in perceptual judgments. Consequently, if all there is to the non-conceptual content of experience is its fineness of grain, then all the content

[50] What, according to McDowell, ensures that these demonstratives involve conceptual capacities is the fact that they persist into the future, and can be articulated in thoughts about past experience: "[W]hat ensures that it is a concept […] is that the associated capacity can persist into the future, if only for a short time, and that, having persisted, it can be used also in thoughts about what is by then the past, if only the recent past" (McDowell 1994: 57).

of experience can be a part of a perceptual judgment. This conception of non-conceptual content is, therefore, in agreement with Milner and Goodale's narrow view of experience.

Hence, the flaw that McDowell diagnoses for "fineness of grain" arguments for non-conceptual content makes them equally liable to fall under Clark's objections. These arguments can only show that there are contents in experience that are not already conceptualized. They do not show, however, that there are non-conceptualizable contents. This implies that the contents of experience can always be part of judgments, for they can always be subsumed by (demonstrative) concepts.

Clark argues, based on Milner and Goodale's evidence, that contents of experience are not used in the guidance of motor activity. He claims that the evidence shows a dissociation between what is part of subjects' experience and the information that guides motor control. In the first chapter I argued that Milner and Goodale's evidence only shows a dissociation between motor guidance and the contents of experience that can be part of judgments. The claim that there is a dissociation between experience and motor control presupposes a view of experience according to which the contents of experience are only those that can be part of judgments.

Clark portrays all the theories of non-conceptual content as adopting the "fineness of grain view"; that is, as adopting a view in which the non-conceptual contents of experience are concept-ready and apt to be part of judgments. For this reason the theories are vulnerable to his attacks. In other words, Clark characterizes those theories as agreeing with the narrow view of experience. If they agree with these view, then they grant the presupposition that is required to justify the claim that there is a dissociation between experience and motor control.

If richness of detail is all there is to non-conceptual content, then Milner and Goodale's evidence clearly shows that there is a dissociation between the contents of experience and the information that guides motor action. What this analysis should make clear is that Clark's argument, not only presupposes a view of experience according to which experiential content is concept-ready, but also characterizes theories of non-conceptual content in a way that agrees with this view. For this reason, Clark's argument is tendentious, insofar as it presents the theories in a way that makes his conclusion inevitable.

This portrayal of the theories of non-conceptual content clearly misrepresents Cussins' view. There is a fundamental difference between Cussins' (2003) proposal and the fineness of grain theories of non-conceptual content. While the latter argue for a negative characterization of non-conceptual content, the former argues for a positive characterization. Fineness of grain arguments intend to show that there are contents in the visual experience of subjects for which they do not possess the relevant concepts. Cussins, however, not only adopts the idea that non-conceptual content is a type of perceptual content that exceeds subjects' conceptual capacities (i.e. he adopts the negative view), but he also makes an attempt at a positive view, by characterizing non-conceptual content as *mediational content.*[51] According to Cussins, what links non-conceptual content to motor activity isn't the degree of detail or the fineness of grain of perceptual experience, but the fact that the norms governing non-conceptual content are the same that govern activity. According to Cussins what makes mediational content apt for the guidance of motor activity is the fact that it shares its correctness conditions. In fact, the governing normativity of mediational content is inherited from the governing normativity of skillful activity (Cussins 2003: 156).

This is why EBC doesn't capture Cussins' proposal adequately, and why the arguments against EBC don't seem to contradict Cussins' proposal. In fact, Cussins' theory, as I suggested in the third chapter, is coherent with some of the premises that motivate the dual stream hypothesis. It also maintains that the requisites for visual experience's usefulness in guiding activity are largely different from the requisites for experience's justification of judgments. To put it in terms I've used so far, in Cussins' theory non-conceptual content shows the subject the correctness conditions of motor activity. Later on I will return to the compatibility between this kind of proposal and empirical evidence[52].

Milner and Goodale's theory is evidence against the theories of non-conceptual content only if the narrow conception of experience is presupposed. In other words, what Clark presents as a theoretical consequence of the model and the evidence given by Milner and Goodale, is actually presupposed in the model's formulation and in the interpretation of evidence. Furthermore, the validity of Clark's argument against theories of non-conceptual content depends on the portrayal of such theories in a manner that accords with the narrow view of experience. If this view of experience is abandoned, the evidence would not refute a theory according to which there are

[51] See Section 3.2.2

[52] See Section 4.2

contents in experience which guide motor activity, but which can't be reported because they don't have the appropriate structure to be articulated into judgments.

The inclusion of a notion of non-conceptual content that directly links experience and motor activity depends on the rejection of the narrow view of experience. As I argued in previous chapters, there are strong philosophical reasons to abandon this conception. But there are also strong philosophical reasons to maintain it. In the following section I'll present Clark's arguments in favor of it and explain why, in light of the ideas I've presented in this thesis, the argument isn't satisfactory.

4.1.2 Concepts, experience and agency

The pivotal element in the narrow view of experience that most strongly influences Milner and Goodale's interpretation of the evidence is the criterion for the attribution of experiential contents to a subject. As I said in the first chapter, experiments are explained and interpreted through the criterion of the reportability of contents. According to that chapter's analysis, such criterion implies that only the contents of experience that can be articulated into perceptual judgments, and which are expressible through various kinds of reports, are to be considered contents of experience.

In response to an argument presented by Walhagen (2007) (which differs, but follows the spirit of the argument here exposed), Clark explains that the criterion of reportability isn't arbitrary and has an important philosophical background:

> My own view, that I shall try to defend as the discussion progresses, is that there is a perfectly proper underlying demand here, but one has more to do with deep ties between experience and deliberate response and agency than with any shallow conflation of experience and reportability. It is only when in some sense the agent has access to perceptually transduced information that that information can be counted as given to the agent in her experience. (Clark 2007: 580)

This quote suggests that the reportability of content is a good indicator to know if the *agent* has access to information. The determinant factor to count certain content as an *experience* is its accessibility to the agent; so reportability isn't an arbitrary criterion to ascribe content to a subject's experience. As the reader may have noticed, up to this point Clark's vision of experience is similar to the one I suggested in the previous chapter. Nonetheless, he introduces a factor which causes his

criteria to reach very different conclusions from the ones in my proposal: mainly, Clark agrees with Milner and Goodale's interpretation of their experimental results, while I reject it.

According to Clark, "visual experience should be the experience of an agent, where that is cashed in terms of the direct availability of that information for use in the planning and selection of deliberate, stored knowledge-exploiting, goal-reflecting, and goal-responsive actions" (Clark 2007: 588). This characterization of experience intends to avoid a commitment to the existence of informationally isolated islets of experience, which don't play any role in the cognitive economy of the agent. In other words, it tries to avoid a gap between the agent and her perceptual experience. This is why a necessary condition for content to count as experience is that it may serve as *input* for the agent's decision system; that the content may give the agent reasons for her rational choices and actions.[53]

What lies behind this philosophical stance in regard to perceptual experience is the rejection of the idea that there can be contents in experience that don't play any role in the cognitive economy of the agent and are informationally isolated from other intentional states in such economy. For some authors (such as Evans and McDowell) accepting this requisite implies that the contents of an experience must be prone to enter a conceptual reasoning system.[54] For Clark, on the other hand, the conceptual abilities which the subject may engage in, based on her experiences, don't play such an important role:

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[53] This criterion comes from Evans' proposal (1982), which holds that, for content to count as an experience, it must serve as: "input to a thinking, concept-applying and reasoning system: so that the subject's thoughts, plans, and deliberations are also systematically dependent on the informational properties of the input. When there is such a link we can say that the person, rather than some part of his or her brain, receives and processes the information" (Evans 1982: 158). Several authors adopt similar views. Dretske (2006), for example, suggests that the criterion to ascribe contents of experience is that this content must be a reason for a subject: a necessary and sufficient condition for certain information to be considered a subject's experience is that the information be available to the subject as a reason that justifies her actions, desires and choices (Dretske 2006: 174). For McDowell (1994a), a key element for contents to be considered experiences is that they can establish rational links with other contents; otherwise, the subject's experiences would be *blind*. (This expression is taken from the Kantian slogan, adopted by McDowell, which says "intuitions without concepts are blind". See: McDowell 1994a: Chapters 1 and 3) For an experience not to be blind, it is necessary that this experience be presented to the subject as a glimpse of the world: as presenting features of objective reality (1994a: 54). This can only happen if such content can establish rational links with the web of beliefs constituted by the subject's world view (1994a: 55). That is why McDowell excludes non-conceptual content from the contents of experience: since it isn't conceptual (i.e. it isn't propositional), it's not able to establish justificatory relations with the subject's beliefs.[7] An experience without conceptual content would be a blind experience.

[54] McDowell's thesis is even stronger, since it holds that because of this, the contents of experience themselves must be conceptual, whereas Evans accepts that such concepts may have a non-conceptual nature. Bermúdez and Macpherson (1998) hold that Evans' position is quite unstable, and oscillates between triviality and falseness. McDowell, on the other hand (1994a), suggests that Evans' notion of non-conceptual content fails to avoid a fall into the myth of the given. In this debate, Dretske doesn't take any clear side, but from his criterion one could infer he would at least agree with Evan's position.

> [T]he real point here is (or should be) quite independent of Evan's appeal to the subject as concept-using. What matters, rather, is that the information must be available to the agent qua 'reasoning subject', where this may be unpacked in many different ways, not all of them requiring full- blown concept-use on the part of the agent [...] As long as an animal can form (non-conceptualized) goals, and can become directly and non-inferentially aware of specific environmental opportunities that allow, or that block, the fulfillment of those (limited) goals and projects, then transduced information can be, or fail to be, input to this kind of minimal reasoning subject (Clark 2009: 1465)

Accordingly, it is possible to ascribe experiences to a creature even if it doesn't possess concepts. Clark suggests that what matters is that information be available for the selection and planning of deliberate actions. An Advanced Non-Conceptual Animal (ANA) can be seen as a "reasoning subject" or an "agent", if in a minimal sense: that is, in the sense that it is capable of formulating goals and projects, and perceive in the environment those elements which promote or obstruct the realization of such goals. It can choose courses of action based on perceptual information about its environment. When information is used in this processes, we'll say such information is part of the creature's experience.

In cases of cortical blindness and apperceptive agnosia, the information that guides the patients' behavior doesn't count as an experience, since it isn't integrated with their deliberate actions, projected towards the fulfillment of goals. The responsiveness of the patients' behavior to the visual features of their environment isn't enough to ascribe them experiences because, says Clark, there isn't a clear link with their personal agency. This is the reason why, Clark suggests, we shouldn't ascribe these patients a visual experience, and not because they can't be subsume visual information under concepts.[55] But what does it mean to say that a certain bit of information has or hasn't a link with personal agency? When it comes to a human being, what does personal agency consist in? In other words, what is lacking in DF and blindsight patients, that justifies Clark in denying that they have experiences?

According to his criterion, for information to count as an agent's experience, it must be available for *the planning and selection of deliberate actions, which exploit stored knowledge and which reflect and respond to the agent's goals* (Clark 2007: 558). The most natural interpretation of this view is that information is available to the agent when it is liable to enter in practical reasonings that lead to

[55] In the following section I will return upon some of the characteristics of DF's conduct, which according to Clark show this lack of integration in the form of experience with the "personal agency" of DF.

the formation of intentions. Hence, information would only count as an experience when it is prone to be articulated in judgments that stand in rational relations to other (propositional) states, and contribute to the practical reasonings in virtue of which intentions are formed.

To clarify this point further, it's worth mentioning that the criterion adopted by Clark is entirely based on EBS. Furthermore, it could be considered a reformulation of EBS: "Conscious visual experience presents the world to a subject in a form appropriate for the reason-and-memory-based selection of actions." (Clark 2001: 512). As I explained in Chapter 2,[56] this *reason based selection of actions* amounts to the formation of intentions to act, which include an action type and a target-object ("grasp the cup that's on top of the desk"), and which is based on practical reasonings involving the agent's memory, beliefs, desires, etc. Hence, if information must be available for action selection and planning to count as an experience at all, then it must be available for this sort of practical reasoning that concludes in the formation of intentions. This practical reasoning requires conceptual contents. So, it appears that when it comes to human beings, for information to count as an experience it must be available for conceptual thought.

What seems to be an implicit point in Clark's argument would make this interpretation consistent with the idea that a non-conceptual animal may have experiences; i.e. that there is a fundamental difference between a non-conceptual animal and human beings. In human beings the, so to speak, decision system, which is in charge of the planning and selection of actions, is constituted by concepts and inferences. In non-conceptual animals, the decision system is, precisely, non-conceptual. Hence, non-conceptual contents can be part of the animal's, but not of the human being's, decision system. For humans, the possibility of executing conceptual abilities on the contents of experience seems to be necessary, since our decision system clearly involves these abilities. In other words, what constitutes agency for an animal is different from what it constitutes agency for a human person.[57]

If this is the interpretation given by Clark to the notion of "personal agency", then it is in agreement with the view of agency that I criticized in previous chapters: the view stemming from EBS and the model of tele-assistance, according to which the central element of agency is the formation of intentions (which are isolated, in an important sense, from their bodily execution). This generates a

[56] See Section 2.1

[57] McDowell (2007a) defends a similar point regarding perceptual experience.

very restrictive concept of agency which, furthermore, leads to the problems discussed in the second chapter: first, an underdetermination of bodily movements, which leads to the impossibility of distinguishing movements made by the subject from those that aren't. And second, the impossibility of explaining the epistemic responsibility that an agent assumes for the contents of experience that guide her motor activity, in the cases of responsible action.

4.1.3 An alternative criterion

In the previous chapter I suggested a view of action that follows the line drawn by Frankfurt (1998). A view according to which an agent's actions are not only her intentional actions (in the sense of deliberate, conscious actions, etc.), but any behavior that is guided by the agent. A consequence of this view is that the field of "personal agency" is widened, to welcome non-intentional actions, or actions which aren't the outcome of an explicit intention motivated by practical reasoning. This suggests, furthermore, that the field of personal agency is wider than the field of propositional contents and conceptual reasoning.

Throughout this thesis I have adopted a notion of "the personal" as everything within the logical space of normative relations; i.e. that which can be explained in terms of reasons. In this my proposal agrees with those of Clark, Evans, McDowell, and Dretske. Nonetheless, I've also maintained that, to explain this wider view of action, it is necessary to posit contents in the perceptual experience of the agent that serve to guide the execution of actions: contents which show the agent if her movements are correct or not, in light of the disposition of her environment. This is why I have suggested that there must be contents in experience that hold normative relations with the subject's motor activity. Moreover, I have suggested that, for perceptual contents to play this role, they must be non-propositional, or non-conceptual. In this point, my proposal departs from other authors': I claim that there must be phenomena at the personal level of explanation, which are liable to a normative explanation, but are not propositional or conceptual in nature.

This seems consistent with a reinterpretation of Clark's proposal, according to which all experience must constitute a reason, but not necessarily a propositional reason.[58] This is coherent with the idea that a non-conceptual animal may have experiences (as Clark maintains). If an animal may have reasons even without the possession of concepts, it seems to follow that there can be such things as

[58] For an exploration of the notion of "non-propositional reasons", and a defense of this notion , see: Cussins 2008

non-propositional reasons. This would go against McDowell's view (1994a: 8), according to which only rational links between propositional contents are possible. So far my arguments have intended to show the need for this wider notion of normativity; but the possibility to develop such a notion, against McDowell's contention, is still my burden of proof. However, this is not a challenge that I will undertake in this investigation.

According to this interpretation, what is relevant for a content to be considered a reason isn't if the content is propositional and is able to enter inferences, nor that the subject is able to convey such content as a reason for her beliefs and actions; but rather that the content be able to draw a normative frame that determines what the agent ought to do (where this may be cashed in terms of what the agent must believe, what intentions she ought to have, or what movements she ought to make in a certain situation). If a wide view of agency and action is adopted, as I have suggested, this is possible at the non-intentional level of motor activity. This is, precisely, Cussins' position (2003; 2008). For him, non-conceptual content serves as a guide for motor activity because it provides the agent, within her experience, with a normative frame for her bodily movements.

A consequence of this view is that there can be contents in experience which aren't propositional, but nonetheless play a role in the cognitive economy of the agent. These contents may guide the subject's actions (in the wide sense held by Frankfurt), even if they cannot be used in practical reasoning to formulate propositional intentions. Since these contents are not of a propositional nature, they can't be articulated into judgments, and therefore can't be reported by the subject. But this is no reason for them to be considered "isolated islets of experience", since they have a very clear role in the cognitive economy of the agent: they show her how to move in order to fulfill her goals and intentions, in the particular environments where she is situated.

Following this train of thought, a wider criterion could be presented to ascribe contents of experience to a subject, which follows the line drawn by Clark's criterion but widens it in the direction I have pointed: For information to be considered an experience, it must be mode of presentation of the world for a subject, that serves as input for the initiation and guidance of action. [59] But the role of experience in the initiation and guidance of action must be a normative role. Accordingly, in the words of this thesis: "*x* is a content of experience if and only if it is a content for

[59] This formulation of the criterion is taken from Bermúdez and Macpherson (1998). They criticize Evans' criterion an propose this one in turn. However they do not adopt all the consequences and implications that I draw from it.

which the subject is able to assume epistemic responsibility, be it through the formation of perceptual judgment, or through motor activity". This widening of Clark's criterion is consistent with some conceptions of the non-conceptual content of experience. In particular, with conceptions according to which there are contents that guide motor activity because they draw a normative frame for it. The criterion doesn't imply the postulation of islets of experience, because the non-conceptual contents always play a role in guiding the subject's actions, even if they aren't inputs for her concept-using reasoning system.

To summarize what has been said so far, Clark defends the narrow view of experience, claiming that this view avoids the postulation of isolated islets of experience, which have no link to the subject's "personal agency". This argument shows that the criterion of reportability to ascribe contents to a subject's experience isn't an arbitrary criterion. It's based on strong philosophical reasons. Clark's view of experience and agency has two possible interpretations: the first consists in that all experience must count as a reason and therefore must have a propositional and conceptual nature. The second is that all experience must count as a reason, but admits the possibility of non-propositional reasons. The first interpretation leads to a restricted view of agency, against which I argued in the second chapter. The second allows for a theory of non-conceptual content, in which it plays the role of creating a normative frame for an agent's motor activity, and provides non-propositional reasons for the agent to move in a certain way given her current environment. Adopting the second interpretation does not lead to postulating isolated islets of experience, which is precisely what Clark intends to avoid. If the second reading is accepted, the narrow view of perceptual experience is abandoned, which has been my recommendation throughout this thesis.

4.2 The empirical front: the evidence revisited

In the first chapter I analyzed the dual visual streams hypothesis and the exposition and analysis of empirical evidence done by Milner and Goodale. The conclusion of this analysis was that beneath the hypothesis and the presentation of evidence there is a particular view of perceptual experience. I argued that only in virtue of this conception, do the experiments and cases described by Milner and Goodale manage to support the hypothesis that perceptual experience doesn't play a role in the visual control of motor activity.

In this section I'll argue that, contrary to Clark's contention (2001), the empirical evidence by itself does not rule out a theory of experience that establishes a direct link to motor activity. If the narrow view of experience is abandoned, another interpretation of the same evidence is possible: one consistent with the idea that each stream of visual processing is responsible for a kind of content in experience. The ventral stream would be responsible for the kind of content that fulfills the requisites to warrant and justify perceptual judgments; that is, the kind of content that can be articulated into a judgment. The dorsal stream would be responsible for a kind of content that fulfills the requisites to visually guide bodily movements.

This interpretation of the evidence is (partially) supported by Matthew Nudds: "This distinction between different kinds of content provides a framework for explaining the dissociations between vision and action that occur in the empirical cases. There were three different kinds of case […] All three can be explained in terms of a dissociation between the two different kinds of content" (Nudds 2007: 12-3).

4.2.1 Dissociation in pathological cases

A. Optic Ataxia

Milner and Goodale (1995; 2004) interpret the syndrome caused by lesions in the parietal lobe as a deficit in visuomotor control, which leaves intact the patients' visual experience. In the exposition of these cases they talk about a correct perceptual representation of an object's shape, size and orientation, alongside an incapacity to use the same visual information for the control of bodily movements. As I said in the first chapter, [60] the idea that these patients have an intact visual experience is supported by the fact that they are able to successfully carry out perceptual tasks, which involve the formation of judgments of experience. This interpretation of the results is inevitable insofar as the narrow view of experience is presupposed.

Nonetheless, these results are equally consistent with an interpretation according to which lesions in structures of the dorsal stream impede the visual processing necessary for the formation of contents that have the appropriate, as it were, format to guide visuomotor control. According to my interpretation of these results, these patients do not possess experiential contents that present them

[60] See: Section 1.3.1 A

with the correctness conditions of their movements; that is, the necessary contents to guide activity. Hence, contrary to what Milner and Goodale suggest, these patients' visual experience does not remain intact. What in fact remains intact are the conceptual contents that support perceptual judgments. This is why patients have a normal performance in perceptual tasks, and why their deficit is not reflected in their reports.

In Nudds' terms, the situation of these patients can be described in the following way:

> Her visual experience lacks [non-conceptual] content so, in performing an object-oriented action she doesn't know how to move her body. It may be, of course, that she can work out how to move on the basis of how an object seems to her to be. That will require her to engage in practical reasoning and to form intentions to move in appropriate ways. The resultant movements will not be those of a visually guided action. It may not always be possible for her to work out how to move in the right way to carry out her intentions. There may be properties a bodily movement must have for successful action that the subject cannot easily intend them to have: objects may not be visually presented as having the properties necessary for the subject to work out how to move (Nudds 2007: 13)

What this quote suggests is that contents linked to judgments (conceptual contents, or presentational contents, in Nudd's theory) aren't enough for the subject to know how to move when performing an action. The properties of objects that these contents present aren't the relevant ones to determine which movements are correct to, say, grasp it. The properties that the ventral stream processes enable the formation of appropriate visual contents to select actions and to support the formation of intentions (which these patients preserve). As Nudds suggests, and as I said in the previous chapter,[61] intentions are not the best guides for bodily movements.

The contents that provide a normative frame for bodily movements are excluded from these patients' experiences because of the lesions in the dorsal stream's structures. Hence, these patients don't have the capacity to visually guide their movements. They can formulate intentions based on their experience, but they don't possess a frame that presents them with the correct way to carry them out, or which provides them with negative feedback when there are errors in their movements.

In AT's particular case, one could say that the errors in grasping movements happen because her experience does not show her when her movements are inappropriate. In virtue of this absence of contents, AT is incapable of guiding her movements. She cannot *see*, for example, when the grip

[61] See: Section 2.3

aperture of her hand is inadequate for the size of the object she wishes to grasp. RV, for her part, is incapable of positioning her fingers on the points of stable grasp needed to grasp the object firmly, because her experience doesn't present the position of her fingers as inadequate for the shape of the object she is grabbing. The use of tactile information is necessary for her to receive the negative feedback which, in normal cases, would be presented to her by her visual experience.

This interpretation of optic ataxics' syndrome doesn't have the counterintuitive consequence that a subject's experience will remain intact, even if the subject is systematically incapable of acting on the base of it. According to my interpretation and Nudds', there is a change in the visual experience of these subjects: it doesn't present them with the necessary normative feedback to correct their movements in the light of their environment's disposition and the object upon which they act. Nonetheless, their experience still presents them with the necessary contents to formulate true judgments about these same objects.

B. Visual Form Agnosia and Cortical Blindness

In the first chapter,[62] I argued that the interpretation of DF's and other visual agnosics' symptoms as a deficit in visual experience could only be justified if one presupposes the narrow view of perceptual experience. The greatest evidence to deny that DF has contents of form in her visual experience is her inability to produce true reports about the form and orientation of objects within her visual field. If one assumes that contents of perceptual experience are only those that can be articulated into perceptual judgments, then her inability to produce true judgments clearly shows DF lacks experiences of form. Nonetheless, if one abandons this narrow view of experience and adopts the wide view that I've recommended, the evidence only confirms the more moderate thesis, according to which DF has no contents of form which can be articulated into judgments. This leaves open the possibility of ascribing DF's experience other kinds of contents of form.

[62] See: Section 1.3.1 B

According to the model I've proposed, lesions in the structures of the ventral stream impede the visual processing of information to constitute contents of form that are apt to be articulated into perceptual judgments. The lesion impedes a processing of visual contents that allow DF to recognize, discriminate, and categorize properties of shape and orientation; therefore she lacks a perceptual base to form true judgments about such properties. In other words, there aren't conceptual contents in her experience that can be used as a normative frame for the formation and emission of judgments.

Nonetheless, there appears to be a normative frame to guide motor activity. There is a kind of form content in DF's experience, which presents the conditions of correctness for her movements, and which provides negative feedback, allowing her to guide her movements so they adapt to her environment. These contents alert her of incorrect movements so it is possible to correct their course and guarantee an adequate grasp of objects, the correct orientation of her hand to insert it in a slot, etc. These contents, nonetheless, aren't displayed in DF's reports because they don't have the appropriate format to be articulated into judgment. They lack conceptual format.

Milner and Goodale's theory presents additional evidence to infer that DF doesn't have experiences of form. Clark (2007: 586-7) presents a list of DF's symptoms in virtue of which, he claims, it wouldn't be appropriate to ascribe DF any kind of experiences. From now on I'll present the list of symptoms and explain why I don't consider any of them to be sufficient evidence to sustain what Clark, Milner and Goodale affirm:

> (1) DF is unable to copy line-drawings: "[S]he is totally unable to draw or copy objects visually present in the here and now" (Clark 2007: 586)
>
> (2) DF is incapable of spontaneously using visual information of form to initiate actions: "DF is famously unable to self-prompt the appropriate use of her own form-accommodating visuomotor skills" (Clark 2007: 586)
>
> (3) DF would be unable to judge when an object could fit in a given space: "Suppose DF were to visually inspect a room. She would not (I claim) be able to see that, for example, the non-conceptualized object over there would fit into the non-conceptualized space over here, yet such judgments are surely paradigms of the kinds of judgment meant to be available to an agent in virtue of the non-conceptual contents of her experience." (Clark 2007: 586)
>
> (4) When DF grabs an object she doesn't do so in a manner adapted to the object's function: "DF, though perfectly able (if asked) to grasp a screwdriver with a form-appropriate grip, will

not typically choose the grip that is most apt given her needs and purposes (e.g., to use the screwdriver to tighten a screw)" (Clark 2007: 586)

(5) DF can't evaluate when her activity is well suited to reach a goal or intention. When her visuomotor control is successful, DF is quite surprised: "[E]ven where DF manages to produce a behaviour that is indeed apt for the fulfillment of some goal, plan or project, she is not able to assess her own unfolding activity as well suited to success. Thus she cannot see that her own unfolding posting behaviour is apt to the target" (Clark 2007: 587)

The first point has already been discussed in the first chapter. I claimed that under at least one description the task requires that the subject be able to form true judgments about the sketch she is copying, besides forming a comparative judgment to determine if the drawing made is similar to the original. This shows that the incapacity to copy drawings can be explained by the incapacity to make judgments about shape and orientation, which is precisely the way in which my model interprets DF's deficit.

The second point is simply false. In the first chapter I included several quotes where Milner and Goodale narrate occasions in which DF spontaneously initiated actions, such as grabbing a pencil to examine it more closely or picking up a fork during a picnic. These situations present a sharp contrast with the behavior of patients with cortical blindness, who can only use visual information in *forced choice* situations. In his 2009 article, Clark nuances this point, and holds that the capacity to perceive colors and textures explains the fact that DF can initiate actions spontaneously (2009: 1464). Nonetheless, if you take into account DF's phenomenology, in which objects of the same color fuse into each other,[63] it isn't very clear how color and texture information could be enough to explain the spontaneous onset of actions oriented towards particular objects.

An obvious example of this is when, according to Milner and Goodale, DF managed to walk through an irregular path in a pine forest without tripping with the branches or the roots. In a forest there are no clear differences in the texture and color of objects which allow an easy discrimination between them. I don't consider this can simply be explained by routine execution, since the path through a forest requires planning several actions, not just one: avoiding the tree on the right, clearing the branch to the left, etc., and this requires information about the shape of objects (which allows her to discriminate one from the other) to be available to the action initiation system.

[63] See: Section 1.3.1 B and C

Regarding the third point, the adaptation of means to ends, in this case, requires a categorization of the object: a semantic processing about what its function is (Milner y Goodale 1995: 229). This requires the object's shape be recognized; a task which DF is unable to accomplish. What Clark wants to display here as non-conceptual content (an object's affordance), is actually conceptual content, since it requires the object's semantic categorization. The kind of non-conceptual content which, I suggest, can be found in DF's experience, is more basic. It is content that indicates the best way to move her hands in order to grasp the object. For the grip to adapt to an object's function an additional conceptual ability is needed, which is precisely what DF lacks.

The fourth point does not imply a problem for my model. What Clark says is precisely that DF is unable to form judgments based of her experiences about the shape of objects. Clark himself characterizes this task as the forming of judgments. The point he wants to put forward is that, in case of having non-conceptual contents of form in her experience, DF would be able to form certain judgments about the possibility of placing an object in a certain space. In the first place, Clark talks about the ability to form judgments without involving concepts. Since, in the philosophical frame in which I am working, the ability to judge is the conceptual ability par excellence, I won't discuss the possibility to form judgments without concepts. Nonetheless, it's worth mentioning that it is, to say the least, counterintuitive and hard to imagine how a judgment could be formed without using concepts of any kind; not even demonstrative concepts. If Clark assumes this as a possibility that should be taken seriously in the current debate, he would have to assume the burden of proof. In second place, to judge if an object fits in a space it's necessary to perform a comparative judgment between the form and size ob the object, and those of the empty space. These kinds of judgments are the ones DF is unable to make. Because of this, the fourth point doesn't constitute additional evidence to argue that DF doesn't have shape experiences.

The fifth point is, perhaps, the most problematic for my proposal. For starters, I'll have to say that the tele-assistance model and the EBS hypothesis don't have a conceptual apparatus that allows them to distinguish this pathological situation from the condition of normal human beings. The dorsal-dependent information which, according to Clark, is useful to guide movements but isn't found in DF's experience, can't be found in the experience of any other human being. Thus, achieving success in any motor activity should be surprising to all human beings each time they carry out an action, since the whole visuomotor process happens behind their backs, so to speak.

Apart from this, Clark's point still stands: if DF has non-conceptual experiences which she uses to guide her movements, why would she be surprised when her actions are successful?

Points (3) and (5) present a serious challenge for the model I am proposing. What these points reveal is a lack of integration between DF's goals and objectives, and the use of visual information to control her movements. In Clark's words, they show this information is isolated from DF's personal agency (2007: 587). How is it possible that a content in DF's experience can guide her movements, but nonetheless be so isolated from her goals and objectives? According to the alternative criterion I suggested to ascribe experiences, form contents would count as part of DF's experiences and they would play a role in her cognitive economy as an agent. (3) and (5) contradict this idea. However, within the model I am suggesting, an explanation of these two facts can be made, which doesn't necessarily lead to a dissociation of the agent and her experiences.

In the previous chapter[64] I claimed that typical cases of intentional actions involve the use of both types of contents of experience. On the one hand, agents make use of conceptual contents to form intentions to act. On the other, they use non-conceptual contents to guide their movements. In these cases there is an integration of intention and the guidance of movements, which consists in the subject's intention guiding the subject in the process of guiding her movements. The intention specifies the state of affairs that is sought with the action and to which bodily movements are, so to speak, oriented. In other words, intentional action is typically guided by two normative frames: one provided by the subject's intention, and the other by the disposition of her environment.

This integration is possible partly because both kinds of contents are found in the agent's experience. This allows for the formation of intentions and the guiding of movements to have a common ground in experience. The subject is guided by an intention formed on the base of her experience. Hence, there is a clear relation between the content of the intention and the content of experience. This is cashed out as follows: an agent selects an action (forms an intention) based on the contents of her experience; that is, the contents of her experience enter in the reasoning process that leads to the selection of the action. Also, there is a content that is common to both experience and intention: the object upon which the agent intends to act is the same object that she perceives. Intentions formed on the base of perception guide the execution of the action. This process of guidance consists in the subject knowing what she means to accomplish with her action and

[64] Section 3.1.1

compensating the errors in movements that would deviate her from accomplishing it. When intentions are formulated on the base of perceptual experience, they allow the subject to have an understanding of the conditions in which her intention may be satisfied in terms of what should happen in her visual field for the intention to be satisfied. This understanding of the conditions of satisfaction in relation with her visual perception allows her to know when certain movements are appropriate to satisfy intention and when they aren't. This is what it means, at least in part, that a subject is guided by an intention when guiding her movements.

DF's pathology has the consequence that her intentions to act aren't formed on the base of her experience, since she can't form perceptual judgments to support her intentions (in the sense of justifying them by entering a practical reasoning, etc.). Nonetheless, she may guide her movements based on her experience, since she counts on the correctness conditions of movements that non-conceptual contents present her with. But these contents can't be integrated with intentions, since the latter aren't based on experience. There is no common ground for intentions and movements. DF may guide her movements, but when she does she can't be guided by an intention, since it isn't based on the contents of her experience.

The fact that DF's intentions are not based on the contents of her experience implies that DF doesn't have a clear notion of what it means to carry out her intention; at least she doesn't have an understanding of its conditions of satisfaction given in terms of her visual experience. DF can understand what it means to grab a hammer, but this understanding isn't integrated with the contents of her visual experience, since she cannot see a hammer. She cannot distinguish its shape, recognize it, or categorize it as a hammer. DF's intention of grasping the hammer hasn't, for her, conditions of satisfaction that she may understand and specify, relative to her current visual experience. That a series of movements guided by her lead to her to grabbing a hammer in the appropriate way is surprising for her, since the movements' *visual guidance* isn't guided, in turn, towards achieving this intention.

This lack of integration explains why, when DF grabs a hammer, she may carry out the appropriate movements to grasp it, but she can't integrate these movements into a propositionally-formulated project: "I will grab a hammer". Since there is no common ground in experience, the process which guides the movements is cut off from DF's propositional intentions. This explains the fact that DF is surprised when her movements are appropriate for fulfilling her intentions. She is unable to evaluate

if her movements are appropriate, or not, for a given purpose because the conditions of satisfaction of her intentions in terms of her visual experience are unavailable.

This does not mean, however, that the information guiding those movements and the process of guidance itself are isolated from DF's "personal agency", as Clark would claim. As stated in the previous chapter, the guidance from an intention is an additional element for action. In the absence of an intention, the process of guidance by itself guarantees that movements are made by the agent and not by some automatic, alien process. What DF's experience of form contents lacks is a link with her propositionally formulated, and rationally selected projects.

This point should be nuanced, of course, if we take into account the fact that DF can spontaneously initiate actions such as grasping objects, catching them in the air, or navigating. There does seem to be some degree of integration between the non-conceptual contents that guide DF's movements and her intentions. This integration allows one to draw differences with cases of cortical blindness. As I said in the first chapter,[65] Milner and Goodale claim that a global visual agnosia would be *experientially undistinguishable* from cortical blindness. In that chapter I suggested that we need an explanation of the striking dissimilarities in the behavior of these two types of patients; an explanation given at the personal level. The main difference is that patients with cortical blindness may only use visual information in situations of forced choice, whereas DF retains the capacity to initiate actions in a spontaneous way using visual information.

In the case of cortical blindness, ascribing experiences to patients would amount to postulating the dreaded islets of experience that play no role in their cognitive economy. For these cases, the model I suggest could concede that visual information guiding movements isn't found in the subject's experience. In these cases, visuomotor control may happen without the subject's awareness, and the guidance of movements may occur merely through subpersonal routines. My model allows for this to happen. The difference with DF and SB would be that for them visual information of shapes does play a role in their cognitive economy, since it allows guiding movements to initiate and execute actions in a spontaneous way. Because of this difference, one may say that DF maintains non-conceptual contents of form in her experience, while patients with cortical blindness do not.

[65] Section 1.3.1 B and C

DF's capacity to begin actions oriented towards objects in a spontaneous way could probably be explained by the presence of color and texture contents, as Clark suggests. As I mentioned above, this interpretation isn't very plausible, because of her difficulty to distinguish objects from their background, in some situations. Which of these is the correct interpretation of DF's abilities is a question that will remain open for the moment. The available evidence doesn't seem sufficiently conclusive to choose any of the options, since it seems to be compatible with both. One could only answer this question by designing the proper experiment; one that tests DF's ability to initiate spontaneous actions upon objects that she can't discriminate by means of color or texture cues. On the other hand, a developed theory of perceptual content, and of the way in which both kinds of content are related, is necessary to explain precisely how the integration of intentions with the guidance of movements is accomplished, in both normal and pathological cases.

To recapitulate what has been said so far: in light of the wide view of experience, what patients with visual form agnosia lack is the processing of form contents that may be articulated into perceptual judgments. These patients' visuomotor abilities are explained by the presence of non-conceptual contents, which play a role in guiding movements, but can't be articulated into judgments. This interpretation is consistent with evidence presented by Milner and Goodale, and has two additional advantages: (1) it allows for an explanation, on the personal level, of the differences in the behavior of DF and patients with blindsight; and (2), it allows an explanation of why normal subjects, as opposed to DF, may fully integrate their propositionally formulated projects with their movements' guidance, so the success of their motor activity in achieving their intentions isn't surprising for them.

4.2.2 Dissociations between perception and visuomotor control

In the first chapter[66] I presented two groups of experiments that show that in many non-pathological cases there is a dissociation between subjects' perceptual reports and visuomotor control. The first group includes experiments in which the subject doesn't report being conscious of a change in her visual field, but still adjusts movements of her hand in response to such changes. The second group includes experiments in which the subject emits incorrect perceptual judgments about the relative size of two objects due to an optical illusion, but adjusts her grasping movements in an appropriate way, adapted to the real size of the object.

[66] See: Section 1.3.2

In both cases, Milner and Goodale maintain that the information that guides visuomotor control isn't part of the subject's perceptual experience. In the first group of experiments this is said for two reasons: (1) in the cases in which there are reports of a change in stimulus, the report happens 300ms after the beginning of the visuomotor adjustments; (2) in the cases in which no change is reported, subjects were equally, or more, able to adjust their movements to the change. As I said in the first chapter, this interpretation is influenced by the narrow view of perceptual experience. In strict sense, what this experiments show is that the subjects' perceptual judgments happen after, or are inconsistent with, visuomotor adjustments. This evidence can be interpreted in a different way, if one admits there can be contents in experience, which guide movements but aren't part of the subject's judgments. Since we're talking of a different kind of contents it isn't necessary, as I'll explain, to say there is an inconsistency. This is why there wouldn't be a problem in admitting these contents are processed in a swifter and more efficient way than propositional contents that are reported by the subject, because they don't require a process of conceptualization.

In regard to the second group of experiments, the authors seem to infer that if the judgment expressed by the subject is false (when she points to the wrong circle) the subject's experience is equally incorrect, which shows that it's the outcome of an optical illusion. Since the adjustment movements are appropriate, one can infer the visual information that guides them must be correct. They infer from these facts that the information guiding visuomotor adjustments can't be in experience, since it would create an inconsistency with the false content expressed by the subject. So, assuming there can't be inconsistent contents within experience, the authors claim that the information guiding visuomotor control is not part of subjects' experience.

In the first chapter I said inconsistency is a relation that can only hold between propositional contents, since it is a notion defined in terms of truth, and truth is predicated of propositions. This is why the idea that there would be an inconsistency presupposes the narrow view of experience. If a wide view is adopted, the content that guides movements wouldn't be seen as propositional content and, thus, wouldn't be inconsistent with the propositional content expressed by the subject's report.

Nudds explains yet another way in which both contents can be said to be part of experience, without committing to the existence of an inconsistency. In Nudds' words, the experiment's result can be explained,

> without supposing there is any inconsistency in the content of the subject's visual experience. The presentational content of the subject's experience represents the object as having certain (in fact illusory) size; the directive content of the subject's experience represents a property of the movement required to grasp the object. Since the experience represents properties of different things --an object on one hand, and a bodily movement, on the other-- there is no inconsistency. Furthermore, since the subject's visual experience doesn't represent anything as actually having the action-guiding property, the property is not represented in a way that could be inconsistent with the property any object is represented as actually having (Nudds 2007: 13-4)

What the quote suggests is that the (presentational) [67] content in virtue of which the subject emits a false judgment can't be inconsistent with the (directive) content that guides her hands' movements. The reason is that, while the first represents a property of the disc (an illusory size), the other represents a property of the movement that the subject must carry out to grasp the disc.

In other words, one can say the content that motivates the false judgment represents how the world is in a propositional manner (i.e. which is the largest disc). Meanwhile, the content that guides movements is only useful to the subject as a source of feedback to regulate de path of her hand movements, which does not conform a content with propositional structure about a property of the disc (its real size). That is why it is possible to admit that both contents are found in experience, without admitting that experience presents inconsistent contents. In Clark's words (paraphrasing Nudds): "there is no inconsistency in the content of visual experience here, since these different kinds of content share no 'common currency' in which to frame a disagreement" (Clark 2009: 1465)

It's important to note that in his 2001 article, Clark admits there can be inconsistent contents in experience and, hence, that the experiment's results aren't conclusive (2001: 506). He says that admitting this possibility implies the methodological challenge of determining the contents of experience, since different experimental designs could show different contents, which are, potentially, inconsistent (2001: 508). Regarding this point, I'll only say that the model I am suggesting doesn't have this problem and it doesn't need to undertake the methodological challenge, since: (1) it doesn't need to posit inconsistent contents; and (2) it involves a criterion to attribute contents to the experience of a subject, which is useful for both conceptual contents (which are expressed through reports) and non-conceptual contents (for which the subject assumes epistemic responsibility by using them as a guide for her action).

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[67] See: Section 3.2.2

Finally, I'll make a short commentary about the experiment conducted by Johnson and Hagaard (2005): in the first chapter I described this experiment, and said its results point to the existence of a kind of "motor awareness" that isn't necessarily linked with the subjects' verbal reports. I want to suggest these results favor an interpretation in terms of two kinds of contents. This is because, in the second stage of the task, subjects accurately reproduce the hand-trajectory made in the first stage, even though (many times) they don't report the shift in the target that motivated the first trajectory. It would seem, then, that the information used to guide the first movement is useful to guide the second, even without being available for a report. Thus, the information guiding the movement would not only consist of the input for an automatic routine for the online control of the movements; but it would also be available to guide the subject's movement at a later moment. In this sense, it would seem that this information does play a role in the subject's cognitive economy, as I have suggested, and can be counted as content of her experience. Of course, these results could be explained by some kind of short term motor memory. Once again, it would be necessary to propose appropriate experimental designs, which we don't possess, to decide between both interpretations. I leave this question open for further research.

For now, I am only interested in underlining a possible interpretation for the experiments that Milner and Goodale present to build their theory. As long as the narrow view of experience is abandoned, it is possible to propose a kind of content in the subjects' experience which is useful to guide their movements. Since this kind of contents aren't propositional, they wouldn't be inconsistent with the contents reported by the subjects. So it isn't necessary to deny that the information guiding their movements is part of their experience, in order to avoid saying there are inconsistent contents within experience.

4.3 Conclusions of the chapter

In this chapter I defended two complementary hypotheses, which seek to make up for the problems stemming from the dual visual streams theory: a thesis about action and a thesis about the content of perceptual experience. In the philosophical front, the model must answer to the need of avoiding the postulation of islets of experience that don't play any role in the cognitive economy of the agent (which has several formulations in the work of philosophers like Dretske, Evans, McDowell, and

Clark). In the empirical front, the model must face all the evidence presented by Milner and Goodale in favor of the narrow view of experience and the tele-assistance model of action.

In the philosophical front I have argued that the model I suggest doesn't commit to the existence of islets of experience, since the non-conceptual contents I described are always contents that fulfill a function in guiding the subject's actions, even if they aren't inputs for a system of propositional and conceptual thought. I have suggested that in light of the considerations presented in the second chapter, we must adopt a wider view of agency. If it is adopted, it is possible to adopt a wider view of experience without falling in the error of postulating isolated bits of experience that play no role in the subject's personal agency.

In the empirical front, I argued that a minimal reading of the evidence presented by Milner and Goodale is consistent with the model I propose. In other words, if the evidence is interpreted prescinding from the narrow view of experience, it would be consistent with the model I have suggested. In the previous section I underlined some points in which the evidence would seem to favor an interpretation in terms of two kinds of contents. Nonetheless, the purpose of the section was to show the evidence is, at least, consistent with both interpretations. I also underlined two points of debate in which a crucial experiment could lead us to decide between one of the interpretations. For now, the debate remains open, and in need for a concrete and fully developed theory about the contents of experience, the link between them, and the way in which they integrate in intentional action.

Conclusions

Throughout this thesis I have analyzed the dual visual streams hypothesis, as it is formulated by Milner and Goodale. I tried to show that the formulation of this empirical hypothesis is strongly influenced by a philosophical understanding of perceptual experience. This understanding is at the basis of their interpretation and presentation of empirical evidence. This view of experience also leads to an understanding of intentional action, which I have named the tele-assistance model. The view of experience and their model of action are intertwined philosophical theses with important and problematic consequences for the current debate about perception and action.

In the first chapter I discussed the formulation of the theory and the evidence presented by the authors and argued that both are influenced by the narrow view of experience, according to which the contents of experience are only those that can be articulated in perceptual judgments; in other words, conceptual, or concept-ready, contents. In the light of this view of experience, the authors interpret the evidence as showing that the information guiding an agent's bodily movements is outside her experience. I argued that if we put this view aside it is possible to interpret the evidence in a weaker way: as showing that the information guiding bodily movements is not available to be articulated in judgment or communicated in a report. Abandoning the narrow view of experience also entails accommodating the possibility that such information is part of the subject's experience, despite not being liable to be articulated in a judgment.

In the second chapter I argued that the tele-assistance model leads to conceptual problems because it commits to a disassociated view of action. This dissociation consists in postulating two components for action: the formation of an intention, situated at the personal level of explanation, and the execution of the action, a process guided by automatic routines, happening at a subpersonal level. This entails that the theory cannot account for the subject's responsibility over the bodily movements made in the course of an action. There are two reasons for this: (1) the responsibility for a movement implies freedom, and insofar as movements are produced by automatic nomological routines, it cannot properly be said that the subject is free in the execution of their actions; and (2) responsibility for an action or movement involves epistemic responsibility for the information that guides the movement, and to the extent that the information guiding the movement is outside the

scope of the subject's reach (i.e. not available in her experience), the subject can not take epistemic responsibility for such information, and therefore can not be take responsibility for her movements.

A way out of this problem would be to postulate motor intentions for each movement the agent executes. This, however, would lead to an intellectualist view of action, which is inconvenient for several reasons. First it implies a cognitive overload for the agent, who would have to carry out practical syllogisms to select each of her movements. Second, this would have the consequence that the agents were unable to carry out actions in a skillful way, as evidenced by Knoblauch's case. Third, the notion of "intentional action" or "object-oriented action" is blurred, because the content of intentions is no longer a distally specified state of affairs, but a bodily movement.

In light of these considerations it is clear that we need a theory of action in which there is room for some degree of automaticity in the execution but allows an account of the subject's responsibility over her bodily movements. In other words, a theory in which the agent has the ability to guide her movements based on her experience, but which does not involve instrumental reasoning.

These requirements are met by the *glide-path model* of action. This model takes the notion of guidance, as proposed by Frankfurt, as a criterion to distinguish a subject's actions from movements simply happening in her body. In this model, the subject plays a regulatory role with respect to her movements. She *guides* them, in the sense that she is willing to compensate deviations and errors, where the movements take a wrong course. To meet this regulatory role, the subject needs normative feedback that lets her know when her movements are inappropriate to achieve a purpose in a particular environment. This feedback must be received in experience.

This requires that the subject has access, in experience, to the correctness conditions of her movements. Only if experience presents certain movements as appropriate and certain others as inappropriate, can she meet the regulatory role of guiding her movements. The narrow view of experience denies, precisely, that this type of information is available in experience. For this reason, the glide-path model requires adopting a wider understanding of perceptual experience in which there is a type of content in experience that presents the correctness conditions of her movements and is thus able to provide the required normative feedback.

The wide view of experience goes hand in hand with the glide-path model of action. In the third chapter I explored schematically, and not too deeply, the outlines of a theory experience that is consistent with this model of action. In general terms, the theory would have to posit two types of content for experience. A propositionally structured content that fulfills the role of being a warrant for experiential judgments; and a content that presents the subject with the appropriate way to move in a given environment in order to fulfill her intentions. The postulation of these two types of content obeys Milner and Goodale's (2004) considerations about the engineering of the visual system. This theory allows for a notion of non-conceptual content that follows the line drawn by Cussins (2003, 2008) and Nudds (2007). In this view, non-conceptual content has the task of providing the subject with the normative feedback needed to guide her movements. In order to fulfill this role, it must not be propositionally structured.

In the fourth chapter, I defended the proposed model on two fronts. First, in the philosophical front, I argued against Clark's (2007, 2009) view, showing that if one assumes a broad understanding of agency, the wide view of perceptual experience does not lead to the postulation of isolated islets of experience. This defense led to the formulation of a criterion for the ascription of content to a subject's experience. The criterion is the following: "*x* is a content of experience if and only if it is a content for which the subject is able to take epistemic responsibility, either through the formation of a perceptual judgment or through motor activity". When a subject guides her movements based on information about her environment, such movements are actions of the subject and the information guiding them counts as an experience, insofar as the subjects commits to such information by guiding her movements on the base of it.

Afterwards, the model was confronted against the empirical evidence that, according to Milner and Goodale, supports their hypothesis. Taking the discussion in the first chapter as a starting point, I showed that the evidence is consistent with the model I suggest, as long as the narrow view of perceptual experience is abandoned.

Finally, I present a balance of the answers and the questions that remain after this research. Overall the thesis explored two models of the relation between visual perception and action. Each of the models integrates a view of action with a view of perceptual experience. Both models are equally compatible with the empirical evidence reviewed in the thesis.

From a philosophical perspective, there seem to be good reasons to support either model. Milner and Goodale's model, supported by Andy Clark's argument, has the great advantage of clearly avoiding the postulation of isolated islets of experience, since it maintains as a criterion for ascribing content that the information be available to the agent's decision system. In this model experience is of an agent because it is available for the reason-based selection and initiation of actions. However, we can assume a weaker version of this point, in which the notion of agency, and therefore of experience, is extended. This version has the advantage of accounting for the agent's responsibility for her bodily movements and for the visual information that guides them.

A potential problem with the model I suggest is that it expands (perhaps too much) the personal level of explanation. In the second and the third chapter I adopted an understanding of the personal level according to which it comprises everything that is susceptible of normative explanations; that is, all that is liable to be explained in terms of what an agent *ought to do*. Including the subject's movements and the contents that guide them in the personal level of explanation means accepting that there are normative relations among non-propositional *relata*. This view involves a wide conception of normative relations and explanations, which subsumes everything that can be described as correct or incorrect in the light of something else. This clearly goes against what has been traditionally considered as susceptible of normative explanation and as belonging to the personal level of explanation.

McDowell (1994a) is clearly against this. He argues that we can only understand the rational and normative relations as traditionally understood: in terms of deductive validity and probabilification. The central question this work leaves open is how to respond to McDowell. How can we come to understand a normative relation between non-propositional *relata*? Moreover, can we legitimately speak of normativity when talking about bodily movements and non-conceptual content? What support can be given to the notion of a non-propositional reason? On the other hand, is saying that some information equips the agent with a normative framework for her movements sufficient to claim that the execution of actions belongs to the personal level of explanation? The arguments developed in this work seek to show, at least, that this is a road worthy of philosophical inquiry, and should not be dismissed from the start.

An exploratory path for these topics can be found in phenomenology, particularly in Merleau-Ponty's concept of *motivation,* which seeks to open an intermediate space between the notions of

causes and *reasons* (as traditionally understood), showing that there is a wide range of phenomena that require normative explanation, and which are not expressible in terms of judgements and propositions.[68] The understanding of normativity and motivation in the phenomenological line followed by Merleau-Ponty could provide a theoretical basis for my proposal that would go beyond the mere intuition that motor activity deserves an explanation in terms of what an agent ought to do (i.e., how she ought to move in a certain environment to fulfill her intentions) and not just in terms of how, in fact, she moves to perform an action. I am happy for the moment, to point in the direction of this path of research, with the intention of resuming at another time.

More specific questions about the interpretation of cases presented by Milner and Goodale are left open. First, how much must should we take into account the behavioral differences between DF and patients with cortical blindness for an explanation of their clinical conditions in terms of the absence, or presence, of certain contents in their experience? Is it possible to explain DF's ability to spontaneously initiate actions only by the presence of color and texture content in her experience, or is it necessary to postulate some kind of non-conceptual content to which she has access? There is not enough evidence to settle this point, but proper experimental design and the development of a concrete theory about the integration of the two contents of experience is required.

Second, to what extent can we say that information about form is integrated into DF's cognitive economy, taking into account her remaining skills, but also the fact that she is surprised by the success of her motor activity? Can we legitimately say that DF's movements based on visual information are responsible actions? Third, how would we describe the change in the experience of optic ataxics, due to the loss of non-conceptual content? At this point, it would be appropriate to look towards the phenomenological tradition, which I unfairly left aside in this research.

One advantage of Milner and Goodale's model over the one I have proposed is its simplicity. Whereas the glide-path model needs to postulate two kinds of experiential content, and explain the relation between them and their integration in intentional action, Milner and Goodale's model is able to explain the evidence with a much simpler conceptual apparatus. What I have tried to show, however, is that the model's conceptual austerity leads to important failures in the explanation of action.

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[68]See: Wrathall 2006; Merleau-Ponty 2002; Kelly 2010; Dreyfus 2007a; 2007b.

In the realm of the strictly philosophical, there are also some specific questions left to answer. To begin with, the defenders of non-conceptual content must face the task of developing a theory of experience that explains in depth the two types of content and how these are integrated into the experience of an agent, to provide a subject with what McDowell (1994a) calls *glimpses of the world as an independent, objective reality,* at the same time that it allows her to act skillfully in a manner attuned to her environment. This theory should also explain how experience enables the integration of the agent's intentions with the guidance of her movements in performing intentional actions.

This research leaves more open questions than answers. It shows that, both in the philosophical and the empirical field, there are open routes for exploration which are as interesting as they are challenging.

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