

What Is Seeing?

An apple and different ways of understanding perception



Figure 1. Before anyone enters. The apple already exists and interacts with its surroundings.

Imagine an apple on a table in an empty room.

Nobody sees it. Nobody smells or touches it. Does that mean the apple does not exist? No. Its existence does not depend on someone perceiving it.

But being unobserved is not being isolated. The table supports it, it exchanges heat with the air and, if light enters through the window, it absorbs some and reflects the rest. All this can happen without anyone seeing it.

We can describe its mass, composition, shape or temperature. We can also describe its distance from the window. These properties are not all of the same kind: some are attributed to the object considered in itself; others are specified in relation to something else.

Now someone enters and sees the apple. The fruit does not begin to exist or interact with its surroundings at that moment. What is new in our scene is that someone is seeing it. What must we consider to understand this encounter? Let us first clarify how we describe the apple's properties.

With or without an observer, the apple has physical properties.

The object’s properties

What are we describing when we describe an apple?

We can describe what the apple is like: its mass, composition or structure. We can also describe how it relates to other things: how far it is from the window or which surface it rests on.

We will distinguish intrinsic and relational properties: here, the latter concern relations with other objects or the surroundings. This is a guide to our discussion, not an exhaustive classification. [18, 19]



Illustrative section: internal structure.

INTRINSIC PROPERTIES

Attributed to the object considered in itself, in a particular state.

Mass

The mass of this apple.

Chemical composition

The substances it consists of and their proportions.

Internal structure

The organization of its tissues.

RELATIONAL PROPERTIES

Specified through a relation with another object or the surroundings.

Distance

Its distance from the window.

Position

Being on the table and below the lamp.

Weight

The gravitational force on the apple, which depends on the local gravitational field.

Figure 2. Examples of the object’s properties. These examples guide the discussion; they do not settle every question of classification.

These relations exist even when nobody observes the apple. Describing them is not the same as describing processes such as warming in sunlight: we turn to interactions on the next page.

Our focus will be perception. The apple is there and someone sees it: what must we explain to understand this encounter?

One apple, different areas of study

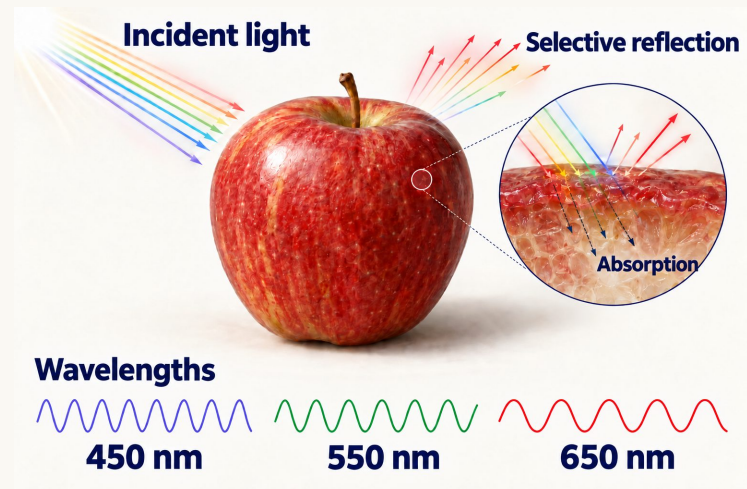
From the object's properties to what happens when it interacts.

PHYSICAL AND CHEMICAL

The apple and its surroundings.

It reflects and absorbs some of the light it receives. It can warm up by absorbing solar radiation and also exchanges heat with the air.

Wavelength describes light; it is not a little piece of redness travelling through space.

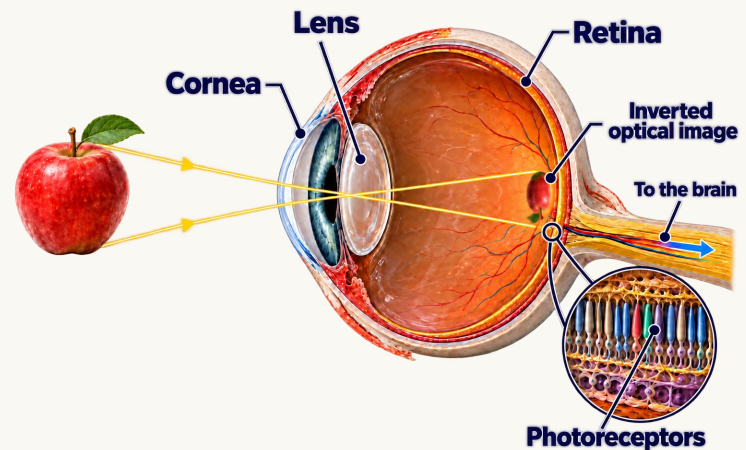


BIOLOGICAL

The apple and an organism's processes.

Eating it involves swallowing, digestion and the absorption of nutrients.

In vision, the cornea and lens focus light on the retina. Photoreceptors respond and signals travel through the nervous system. [17]



PSYCHOLOGICAL

Is seeing an apple the same in every situation?

Think of an apple seen in passing outside a fruit shop. Now imagine searching for one among other fruit, or finding one unexpectedly in the middle of a desert.



Your eyes and nervous system participate in all three cases. What, then, changes in the act of seeing? To answer, we must consider the person, what is seen and the circumstances of the encounter.

A note on terminology: this essay speaks of “seeing”. After introducing Kantor’s account of attention, we will return to its relationship with “looking” and “watching”, and with the Spanish verb *mirar*.

Figure 3. One encounter, different aspects to study. Optics also operates in the eye; biological processes participate in perception. Generated, simplified illustrations, not to scale. Cell colours are conventional. [1, 17]

What are we studying when someone sees an apple?

Past experience and present circumstances are part of the question.

Imagine seeing an apple on a table. Through earlier encounters with fruit you have learned to recognize it and distinguish some of its qualities. Perhaps a small mark tells you that it has gone bad. You need not have seen this particular apple before: your history with other fruit participates in this new encounter.

But that history does not explain everything. What if you are hungry? What if you have just eaten, or are ill and feel nauseated? You may still recognize the same apple, although different details stand out and your relation to it changes. Finding it in a fruit shop is not the same as finding it on a hospital tray.

On the interbehavioral approach we will develop, to study the psychological is to study these relations: how they took shape over an organism's history and how they occur in present circumstances. Hunger or discomfort need not be what you see; they can alter your encounter with the apple. Later we will see how Kantor includes such conditions in his account of setting factors.

Light, eyes and the nervous system participate throughout. There is no psychological extra that appears afterwards: we distinguish what we study when describing those processes from what we study when describing this organism seeing this apple, with its history, present state and circumstances.



Figure 4. Eve offers the apple to Adam. A scene from Western pictorial tradition, reimagined for this essay. AI-generated illustration.



HISTORY

Earlier encounters with fruit.



PRESENT STATE

Hunger, fullness or discomfort.



CIRCUMSTANCES

Fruit shop, hospital tray or the story of the tree of temptation, Eve and the serpent.

The same apple can be seen in different encounters.

One apple, several ways of sensing

Seeing is our example, not the whole of perception.



Figure 5. Now there is a perceiver. The same apple is available to sight and, through further interaction, to smell, touch, taste and hearing.

We have focused on seeing, but there are other ways to perceive the apple. You can see its shape and colour. If you bring it closer, perhaps you notice its smell. When you pick it up, you feel its weight, the smoothness of its skin and its temperature. When you bite it, there is flavour, texture and perhaps an audible crunch.

These are different ways of encountering the same fruit. Each involves different bodily capacities and different conditions. Light allows you to see it; airborne molecules make smelling it possible; handling it brings its surface into contact with your skin.

Not everything we sense concerns external objects. You may feel hunger before reaching for the apple or fullness after eating it. Perceiving aspects of our internal bodily state is called *interoception*.

We will continue with sight because we can explore the same scene through pictures and small changes. The broader question concerns perception: how living beings come into contact with their surroundings and perceive their own bodily condition.

Let us return to the moment before picking up the fruit. The apple is on the table. Light reaches your eyes. Your nervous system is active. Where, in this encounter, does the act of seeing the apple occur?

Our initial distinction now helps clarify the question. Your eyes and brain are as physical as the apple and the light. But describing them separately leaves open the question we will pursue throughout the essay: **what it is to see this apple**.

Does that seeing belong entirely to one of its participants? Or is it an activity we can understand only by considering the perceiver and what is perceived together? We can begin exploring the question with something apparently much simpler. The apple looks red. What happens when we change the light but leave the apple where it is?

First, change the light

Keep the apple and the observer in place. Change only the illumination.

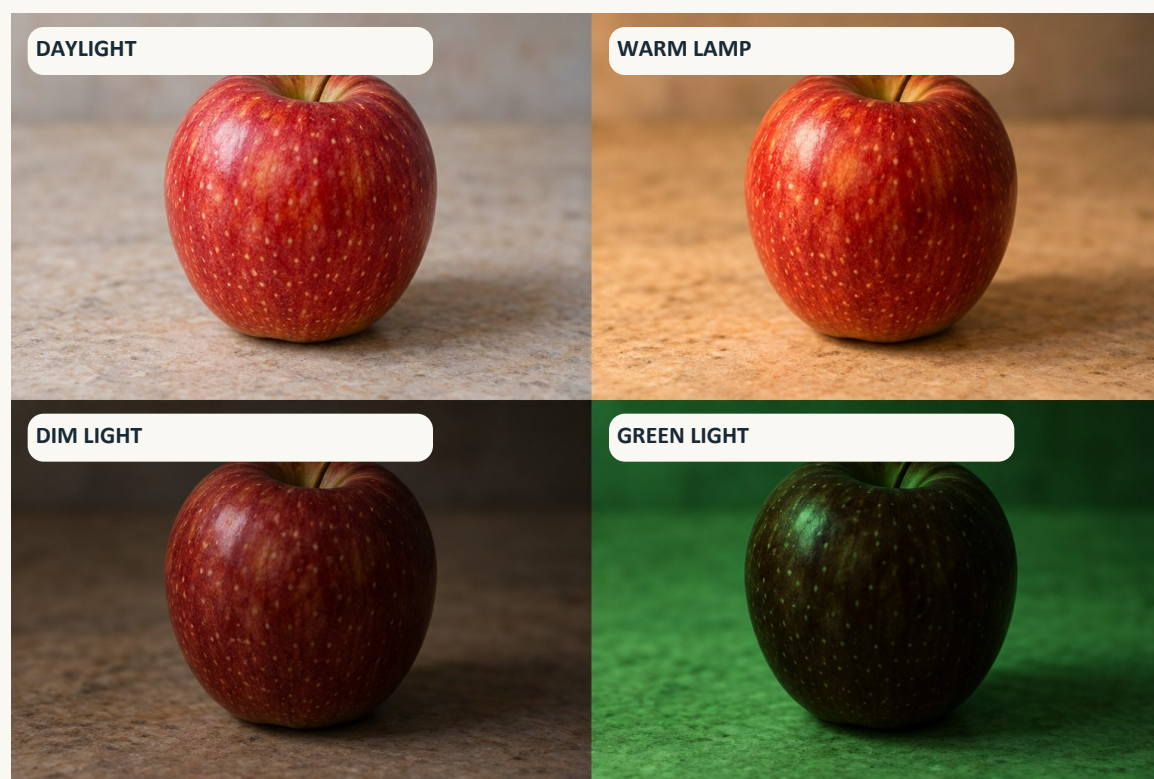


Figure 6. Same surface, changing appearance. Less colour information is available in dim light; a restricted lamp spectrum can darken the apple. Illustrations, not calibrated predictions.

Leave the apple where it is and replace daylight with a warm lamp. The fruit has not become a different object, but the light it reflects has changed. Its surface absorbs some components of light more than others. What reaches your eye therefore depends on both surface and illumination.

Now dim the light. As the room becomes very dark, colours become harder to distinguish. Under a lamp emitting mainly green light, the apple may look much darker: a surface that reflects red light well cannot reflect much of it if it receives very little. The exact result depends on the apple and the lamp.

Even so, the fruit's colour may look relatively stable as illumination changes. This stability is called *colour constancy*. It is not simply remembering that the apple is red: you can know that even when it now looks different. A good account must explain both stability and change. [1]

What if this person had grown up under very different lighting? Their first reaction would not tell us everything about their ability to see under the new conditions. We would need to follow them over time: what do they initially distinguish, and what do they learn when meeting the same objects under different lights? Perceptual history does not end when an experiment begins. Each new encounter can change the skills we bring to the next.

Such experience might support colour constancy, but we should not assume how far it would do so. Becoming accustomed to a fixed light is not the same as maintaining stable colour appearance when illumination changes.

Switch the light off completely. The apple remains, but you are no longer seeing it. Turn it on again. Now let us keep the light and fruit, and change who is looking.

Same apple, different eyes

What can each visual system distinguish?



Figure 7. Different eyes, different available contrasts. Dots are schematic: a colour distinction available to a human may be lost to a dog; a fly can use ultraviolet. They are not measured apple colours or subjective-view simulations. [2, 15]

Imagine a dog beside you. Both of you are looking toward the same apple, but your eyes do not make the same colour comparisons. Most humans have three classes of cone cells, the light-sensitive cells used for daylight colour vision. Dogs have two. Experiments confirm that dogs distinguish colours, but not all the differences available to typical human vision. [2]

A red apple against green leaves can therefore lose a colour contrast that helps a human spot it. That does not make the apple invisible to the dog: brightness, shape and edges may still separate it from the background. Nor do dogs see only black and white. The important change is in which differences their visual system can distinguish.

Now consider a fruit fly, specifically *Drosophila*. Its visual system includes sensitivity to ultraviolet light, which human eyes do not normally see, as well as blue- and green-sensitive receptors. Experiments show that flies can learn colour discriminations. [15] A photograph made for human eyes cannot tell us exactly what the apple looks like to the fly; it does not even record all the light relevant to that animal.

The diagram above therefore compares usable visual differences, rather than inventing a fly's private picture. The apple is the same, but what can be seen depends on the observer. Even this is not the end of the story. Two people with similar eyes may arrive at the table with different recent experiences.

The surroundings and the past matter too

A recent change and learning over time.

TRY THIS: COMPARE THE TWO CENTRE PATCHES

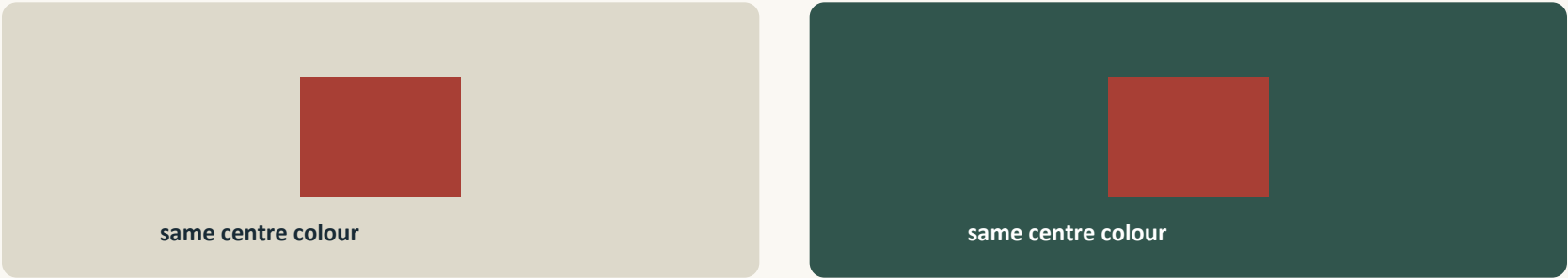


Figure 8. Change the surround, not the centre. Both red patches use exactly the same colour value. Their surroundings differ; compare their appearance on your display.

Look at the two red patches above. Their centres have exactly the same digital colour, yet the different surrounds can affect how they appear. This small demonstration separates something we can specify in the display from something we experience while looking. In a real room the surroundings can also bounce extra light onto the apple, so a careful experiment has to keep that additional change under control.

We already know that the person brings a history to the encounter. Here we can observe a more immediate effect: look at a strongly coloured surface before returning to the apple. Adaptation in your visual system during that exposure can affect what you see afterwards, even though you have not acquired different eyes.

A longer history can also matter, but not always in the same way. Experiments using images of familiar fruit suggest that knowing its usual colour may influence the colour adjustment we judge to be neutral. That differs from learning to notice signs of damage, as someone who sorts fruit every day might. [3]

Red has helped us begin exploring what participates in seeing: the person, light, surroundings and previous experience. Yet throughout these changes you were encountering an apple, not a collection of coloured patches. What does perceiving it as an object add?

What happened before?	What might change now?
A recent coloured exposure	Adaptation can alter subsequent colour appearance.
Years spent sorting fruit	Practice can change which marks someone notices and checks.

You see an apple, not just a red patch

A hidden side can be available to exploration without being visible now.



Figure 9. Part of the apple is hidden. The box blocks one view; changing position can reveal more of the same fruit. Illustration, not a laboratory record.

Place a small box in front of part of the apple. You no longer see the whole outline, but you do not normally conclude that half the fruit has vanished. Lean to one side and more of it appears. Lean back and that part is hidden again. The box changes your view, not the apple into which you might later bite.

Now turn the fruit. Its far side comes into view, perhaps revealing a yellow patch or a bruise. Before turning it, you did not see that particular patch. Nevertheless, you were looking at a thing that had another side. Seeing the apple is richer than receiving the currently visible red surface.

Here the question broadens: **what is it to see the apple?** Not just its redness, but that object before you, with its shape, hidden parts and possibilities for further exploration. If it were green, the question would remain. Asking where seeing happens will help us examine how we explain it.

A familiar answer says that the eyes send information inward and the brain builds the experience. There is real science behind the study of those bodily processes. But we need to separate what that science establishes from a further claim about what seeing itself is. To do that, let us follow the light into the eye.

How does a brain-based account explain seeing?

From light entering the eye to an interpretation of the scene.

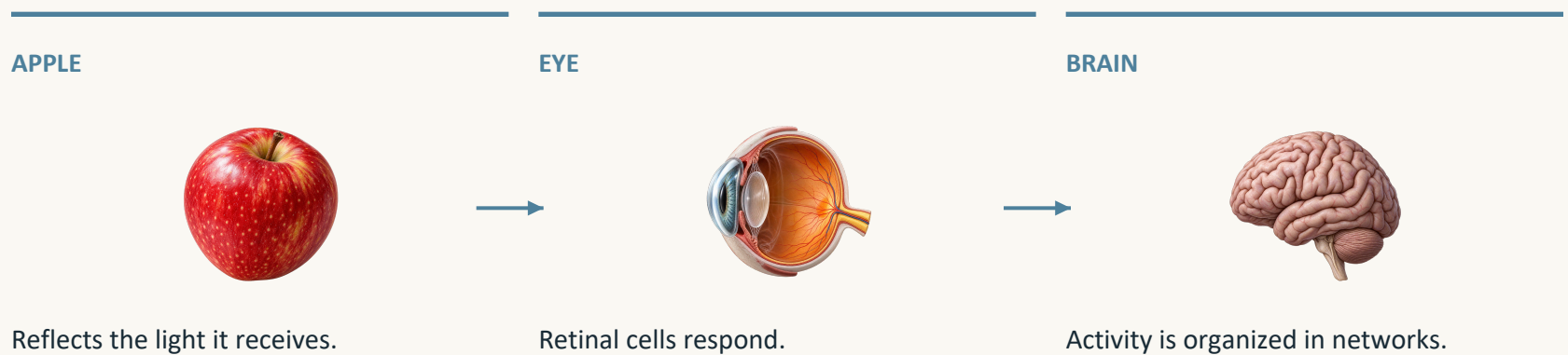


Figure 10. Processes investigated by a brain-based account. This outline does not show every connection or turn the brain into a screen.

Light reflected by the apple reaches the retina. Its cells respond and activity continues through the nervous system. A brain-centred account investigates how its organization enables us to distinguish shapes and colours, recognize objects and guide behaviour.

Francis Crick and Christof Koch offer a specific example. In their account of conscious vision, the brain constructs an interpretation of the scene through neural representations of its different aspects. Previous experience participates in that interpretation. [24]

What does representation mean here? Not a small photograph that someone watches inside the head. The authors refer to the activity of groups of neurons representing aspects of the scene, such as a face. Our apple brings that question into the example used in this essay. [24]

Richard L. Gregory offers another answer: recognizing an object from incomplete cues resembles forming a hypothesis shaped by what has been learned. This does not mean a person consciously states a conjecture every time they see. [22]

A contemporary family of models, predictive processing, examines the relationship between expectations and sensory signals; some versions also include action and the environment. It is not simply Gregory's theory under a new name. What does each model add to the explanation of this person seeing this apple, and how could we test it? [28, 29]

The open question: does explaining these processes explain the whole perceptual encounter?

Is forming a hypothesis enough?

Gregory and Smith agree that history matters; they differ on what counts as the explanation.



01 FOCUS ON BRAIN ACTIVITY

What neural processes enable recognition of the apple?

Retinal and brain activity; the organization of networks and changes associated with learning, attention and context.



02 FOCUS ON RELATIONS

How is this person seeing this apple, here and now?

Object and functions; an organism with abilities, a history and a current state; illumination and context. Brain activity participates.

Figure 11. One scene, two explanatory focuses. The arrows indicate questions about the same encounter, not successive stages. AI-generated scene. The essay's comparative synthesis. [16, 24, 25]

Noel W. Smith explicitly discusses questions Gregory raised in 1974. One asks how we see a table as hard. Smith argues that answering requires studying the object, past encounters, biological conditions and the present situation. [25]

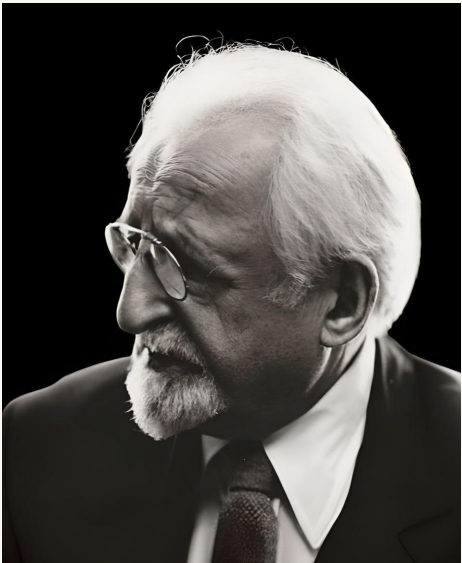
Is changing “mind” to “brain” enough? Smith argues that it is not: we may retain an inner director that interprets and decides while naming it after an organ. He does not say Gregory proposes a tiny spectator inside the head. He asks whether attributing hypotheses to the brain explains the whole act of seeing. [25]

Necessary does not mean sufficient. A lesion that impairs speech shows biological dependence, not that speaking is contained in that brain area. Smith makes a similar point about seeing: neural activity participates, but a person sees an object in a situation and with a history. [25]

The alternative proposes describing the relations, at this moment, between this person and this apple, with their functions, history and circumstances. Let us see how Kantor organizes that study.

Seeing the apple: an interaction we can study

J. R. Kantor: the person, what they see and the conditions of seeing



J. R. Kantor
1888-1984

What if understanding seeing began with the interaction between the person and the apple?

Jacob Robert Kantor proposed studying organisms’ interactions with objects and events in their surroundings. In our example, we would not study only the apple, or only the observer’s eyes and brain. We would study this person seeing this apple, in particular circumstances and with a history of previous encounters. He called his approach *interbehavioral psychology*. [4, 5]

What must we distinguish to explain that interaction? The apple being seen, the person seeing it and the illumination that makes seeing possible. The circumstances of the encounter and the person’s history also matter. Distinguishing these elements helps us understand how they participate together in seeing.

Light acts as a *medium of contact*: here we mean visual contact, not touching the apple. Switching off the lamp removes visual access, not the fruit. Light reflected by the apple enables seeing but does not replace it. Kantor warns against confusing the medium with the object whose qualities we perceive, since they are distinct. [16]

Here we will focus on seeing and identifying it. How are the elements we have distinguished organized? Kantor studies them as an *interbehavioral field*. In *The Science of Psychology*, written with Noel W. Smith’s collaboration, he explains their relations. The next diagram helps us follow them. [16]

WHAT YOU SEE, WHAT ENABLES SEEING, AND WHO SEES

OBJECT



the apple being seen

MEDIUM OF CONTACT



illumination enabling seeing

ORGANISM



the person seeing it

Figure 12. Light lets you see the apple; it does not replace the apple. Switching off the light removes visual access while the fruit remains.

The interbehavioral field

The apple being seen and the person seeing it, under these conditions

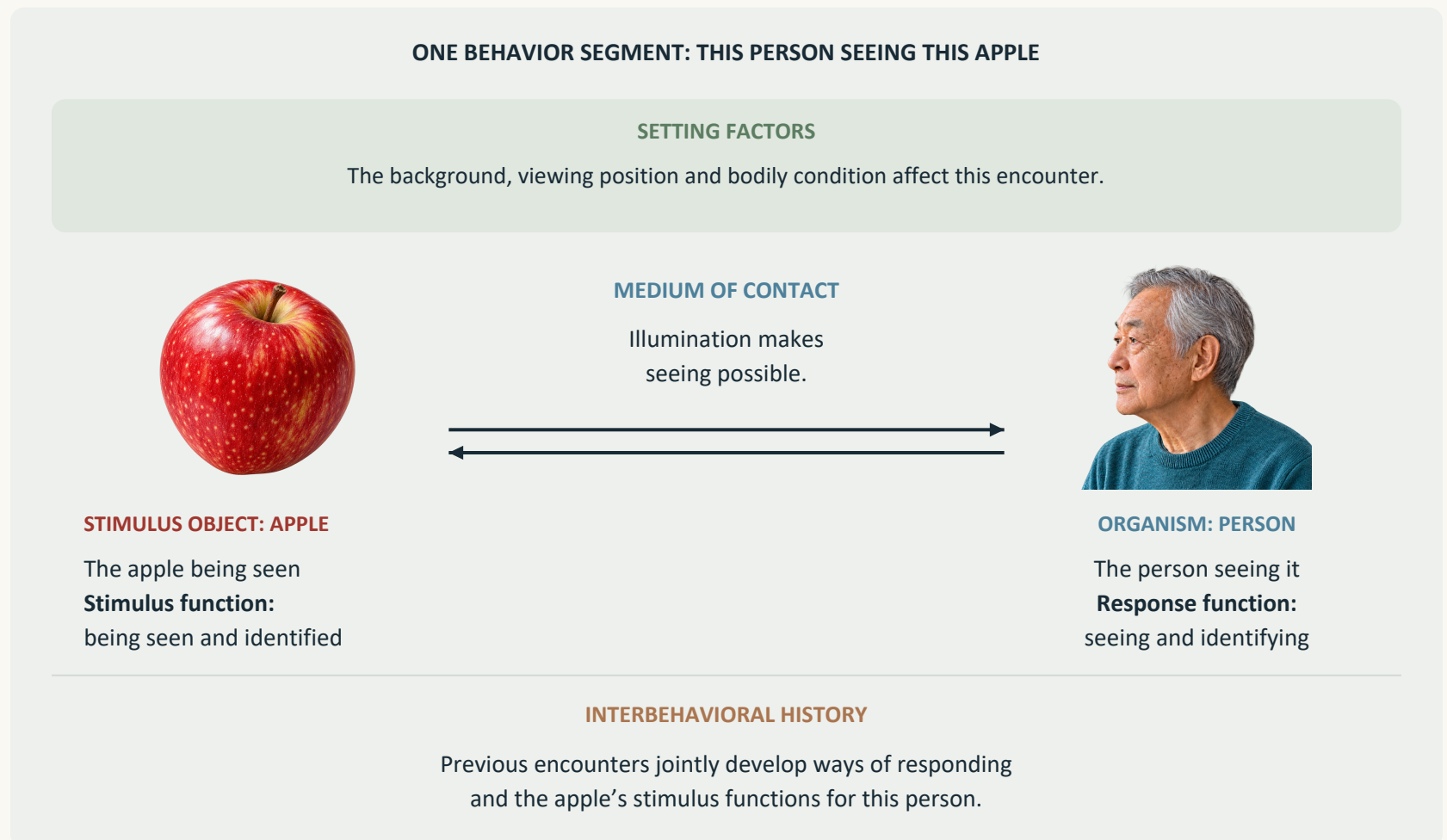


Figure 13. The field is the organized encounter. The two arrows mark corresponding participation, not the transfer of a mental picture. Original explanatory diagram based on the elements discussed in Chapter III of the supplied edition. [16]

The diagram brings together the elements already introduced, but adds something decisive: it asks how they participate together in a particular episode. Kantor calls such an episode a *behavior segment* within the ongoing course of interactions. The field is its organization, not merely a list of things present. [6, 16]

The *stimulus function* names the apple's participation as the object seen and identified; the *response function* names the person's corresponding seeing and identifying. These are two aspects of one interaction. Here, 'function' does not mean a motive such as curiosity or a task such as checking for damage.

The object is not identical to its stimulus function, nor the person to a response: we distinguish what each contributes to this episode. History and circumstances help explain that participation. One question remains unanswered by an inventory alone: why does the person make contact with the apple rather than something else?

Attending is not yet identifying

Illumination enables visual contact; attending and perceiving have different roles.

The person could be looking at the window even though the apple is illuminated on the table. Turning towards it changes the object contacted. Kantor calls the beginning of this psychological contact *attending*. Distinguishing it lets us then ask what the person identifies. [16]

Perceiving answers a different question: what are you encountering? You discern the apple and its qualities. In the book, attending and perceiving are distinguishable parts of an organized response, called *reaction systems*. These are activities of the whole person, not separate little agents inside the brain. Their bodily components include eye movements, posture and neural activity.

The book's attention schema includes the stimulus, the operation of the medium, attending, perceiving and a final act. The diagram below separates their roles using our apple. It is not a conveyor belt carrying an apple-picture into the head. Attending and perceiving may occur so closely together that they are difficult to distinguish in observation.

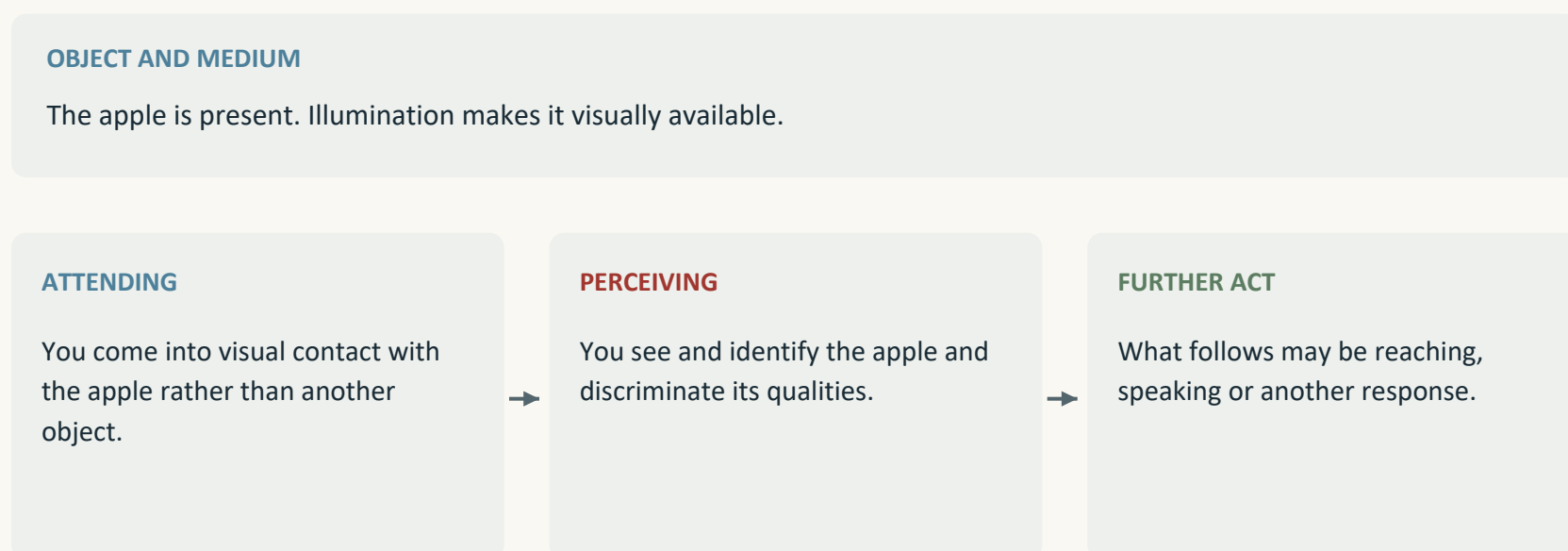


Figure 14. Different roles within a response. A plain-language reconstruction of the attention schema in Chapter X. The arrows show the organization of activity, not signals travelling through anatomical stations. The further act is not another name for perceiving. [16]

Why this apple now? The book relates attending to conditions on both sides of the encounter: features such as contrast or movement, and the person's past experience and present condition. Illumination alone therefore does not explain why this particular object becomes the one being perceived.

Before distinguishing types of perception, let us pause over the words we use. If attending need not mean concentrating or adopting a particular posture, is saying that someone is looking enough to describe what is happening?

Is it enough to say we are looking?



Figure 15. Gaze direction is not enough. Is she contemplating the sea, remembering what she has just read, or thinking about another event? The direction of her gaze is not enough to tell us. AI-generated illustration.

Imagine looking out to sea while remembering a conversation from yesterday. Your eyes are still directed towards the water, but that posture alone does not tell us what you are seeing or how the sea is involved in what you are doing. Perhaps you distinguish the waves while remembering; perhaps you suddenly notice a boat and the memory is interrupted.

Something similar happens in a room: while you follow the speaker's words, there are conversations and other sounds in the background. You may hear them without following them, cease to notice them, or attend to them when someone drops a glass. The physical presence of those sounds does not yet describe your relationship with them.

These examples help explain why Kantor distinguishes his analysis of attention from everyday uses of the word. Keeping your gaze in one direction, concentrating on a task and entering into interaction with something are not interchangeable descriptions.

That is why we retain “seeing” in this essay, without reserving it exclusively for biology or treating “looking” as a guarantee of the psychological. The distinction between the verbs can help describe certain situations, but it does not replace an analysis of what happens. We may search for an apple or encounter it unexpectedly; examine it or recognize it in passing. We are not doing the same thing, although sight participates in all these encounters.

The question is not only where our eyes are pointing, but: what are we interacting with, in what way, and with what details at this moment?

Seeing and identifying the apple

Primary perception is one type, not a definition of every perceptual encounter.

We have distinguished attending from perceiving. But is everything we identify equally complex? Kantor distinguishes four types by their complexity and their connection with what follows. *Primary perception* is the simplest: discriminating qualities of an object, with an identifying response. This is the aspect of our example we are focusing on. [16]

This does not mean that every instance of seeing an apple is primary perception. You may also appreciate its uses, its value, or its relevance to the present situation. The book's distinctions help us avoid treating all these encounters as if they were the same.

Type in the book	What is discerned	Relation to further activity
Primary perception	Simple discrimination of qualities; identification.	Closely connected with a single elementary act.
Simple apprehension	More than one meaning or significance.	One of several possible acts may follow.
Complex apprehension	Uses, values and relevance to the circumstances.	An act may be carried out or withheld.
Comprehension	A more developed appreciation of the object in direct contact with it.	Independent of an immediate further performative response.

Table 1. Types of perceiving. Paraphrases of Chapter XI, not four successive stages in every act of seeing. [16]

In primary perception, identification is closely linked to a simple subsequent act. The other types allow a wider range of outcomes. The table does not separate perception from all later activity: it distinguishes what is perceived from what may be done afterwards, such as examining, picking up or eating the fruit.

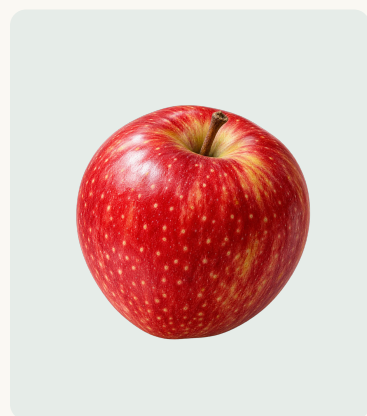
Before returning to eyes and brains, let us consider one last variation: what happens if the apple is not in front of us, but we see its photograph or hear its name?

What if the apple is not in front of us?

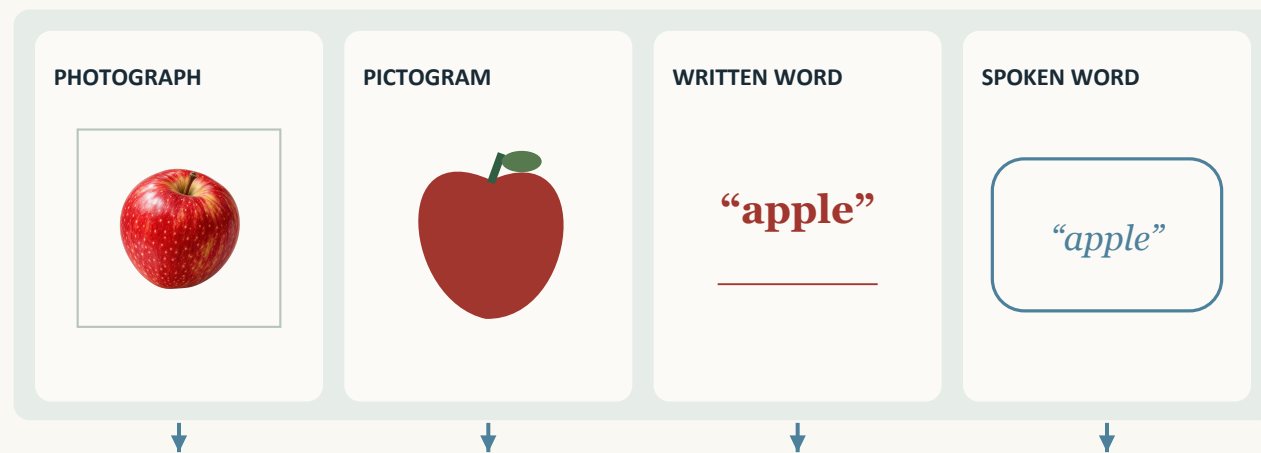
An image or a word can refer us to an absent fruit.

So far we have discussed seeing an apple that is present. Let us remove it from the table. Show a photograph in its place, then a pictogram. Finally, write “apple” or say the word aloud. In each case there is something present with which the person comes into contact: they see an image or letters; they hear a word. They are not seeing or hearing the fruit we removed.

THE FRUIT IS PRESENT



THE FRUIT IS GONE



LEARNED RELATIONS: THEY CAN REFER US TO THE ABSENT FRUIT

Figure 16. Different things present can refer us to an absent apple. We see the photograph, pictogram or written word; we hear the spoken word. The arrows show possible learned relations, not physical identity or experimentally demonstrated equivalence. [4]

Yet any of these encounters *may* lead the person to speak of the apple, search for it or recall its taste. That is not because the photograph, pictogram and word are progressively less real versions of it. All are real objects or events, but our relation with each has developed differently. A spoken word need not resemble the fruit visually at all.

The logo of a familiar brand may also make us think of its computers or phones when none is present. Its function depends on a history of encounters, not just its shape. In Kantor’s terms, some present objects can acquire a *substitutive function*: they participate in a response developed in relation to another object or situation. That does not make the present encounter an unreal act. [4]

The question remains concrete: what is before us—or what are we hearing—and what are we doing in relation to it? But one distinction remains: does the photograph refer us to this particular apple, or are we speaking about apples in general? Another example will make the difference visible.

Ivy is not just any “apple”

An individual dog and the category we can use to describe her.

In our scene of Adam and Eve, a particular apple appears; the word “apple,” by contrast, can name any fruit of that kind. Ivy helps us see the same distinction more clearly: “golden retriever” names a type of dog, whereas Ivy is an individual animal with whom someone shared a life.



Figure 17. Ivy and other members of the same breed. Left: Ivy, a real dog in a photograph. Right: a generated illustration of other dogs. The shared category does not exhaust what seeing Ivy’s photograph may mean to someone who shared their life with her.

Someone who never knew Ivy may identify a golden retriever in the photograph. Someone who shared a life with her may recognize Ivy in particular, notice familiar features, and remember moments they spent together. To explain these different ways of seeing her, we must also consider each person’s history of interactions with the animal in the photograph.

The other dogs are individuals too, not interchangeable specimens. The concept “golden retriever” lets us group them; it is not another dog hidden behind the photographs. Nor does the form of a sign fix its function: the written name “Ivy” can refer to her, while her photograph could be used to show someone who never knew her what this breed looks like.

This makes the idea of substitution more precise: there is no automatic equivalence between fruit, photograph, drawing and word. Something present may refer us to this individual or to a class, depending on learned relations and circumstances. Before returning to the role of eyes and brain, let us keep in view the difference between seeing something and describing everything that occurs when someone sees it. [4]

Eyes and brains are essential. What are they doing?

Noel W. Smith on the difference between equipment and an encounter

“seeing is more than the biology of eyes and brains.”

NOEL W. SMITH • THE INTERBEHAVIORAL FIELD

Noel W. Smith, who worked with Kantor and developed the interbehavioral approach, addresses that contribution by distinguishing two research questions. One concerns bodily resources; the other concerns the encounter in which the person uses them. His observation places biological research within the problem we have been following. [7]

Facing the apple, we can investigate the retinal and brain activity that enables discrimination of its outline. We can also ask what this person is identifying and how previous encounters contribute. For Smith, describing bodily mechanisms does not replace investigating these relations.

Biology opens possibilities and imposes limits. It helps explain why a person can see under some conditions and not others. A psychological description asks how that person is interacting with this apple now. Smith argues that we should not simply replace the second description with the first.

With Smith we have clarified the questions directed at the body. We can now turn to the surroundings: what information does the perceiver find there? James J. Gibson studied this problem by starting with an animal capable of moving, not a stationary camera.

THE BIOLOGICAL QUESTION

What are the eyes and nervous system doing?

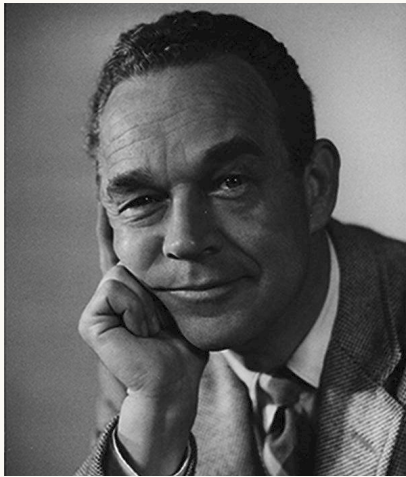
THE PSYCHOLOGICAL QUESTION

How is this person interacting with this apple?

Figure 18. Two questions about one activity. Studying bodily mechanisms and explaining the person’s seeing are related tasks. One description should not silently replace the other.

The world offers more than a snapshot

James J. Gibson: information and possibilities for an active animal



James J. Gibson
1904-1979

James J. Gibson asked what an active animal can discover in the world around it. This became known as the *ecological approach* to perception: an approach that studies the animal together with its environment. Rather than begin with a frozen image in the eye and ask how the brain reconstructs a world, he investigated the changing views available as the animal explores. [8]

The box showed us that moving reveals previously hidden parts. Gibson is interested in the order of those changes: as you lean, surfaces appear or become hidden in ways related to the objects' shapes and positions. That order offers information an isolated image does not capture.



GRASPABLE FOR THIS HAND

The apple's size and shape fit this person's grip. Change the body or the object, and that possibility can change.

Figure 19. An affordance is a possibility for action. Graspability concerns the fit between a body and an object; it is not a property of either considered alone.

He also drew attention to what the environment makes possible for an animal. The apple may be graspable for your hand, but not in the same way for a tiny fly. He called such possibilities *affordances*. Whether something affords grasping depends on the object and the body together, not on either one alone.

This is close to Kantor in one important respect: the explanation includes a living being and its world. But the emphasis differs. Kantor asks how to describe a psychological event with its setting and history. Gibson asks what information and opportunities an exploring animal can find. Neither programme is simply the other with new names.

The apple is now more than something that sends light toward a passive viewer. It is something we can approach, uncover and grasp. That leads to the next proposal: perhaps the connection between what we do and what we see is part of seeing itself.

What you do changes what you can see

The joint sensorimotor account of J. Kevin O'Regan and Alva Noë



J. Kevin O'Regan



Alva Noë

“seeing is a way of acting.”

J. Kevin O'Regan and Alva Noë made that proposal explicit in their 2001 account of vision. They described seeing as a way of acting: a skilled way of exploring the environment, rather than simply having a picture activated inside the brain. [9]

The new step is not merely recalling that movement changes the view. It is asking about your mastery of those changes: you approach to see better, lean to reveal what is hidden, and turn the fruit to access another side. Your action is attuned to what can become visible.

The authors call these relations *sensorimotor contingencies*. The term joins sensation and movement: in plain language, how what we receive through the senses changes with action. Knowing these relations does not require reciting a rule. A child can lean around an obstacle without knowing geometry.

On this account, seeing involves practical command of such relationships. That does not mean you must be visibly moving every instant, or that moving a camera makes it conscious. The claim concerns a perceiver's skills and sensitivity to what would change through exploration. It is a theory to investigate, not a conclusion proved just by drawing an arrow.

O'Regan and Noë later developed different parts of this project. We can follow O'Regan back to the red surface, then follow Noë around to the apple's unseen side. Both routes return us to the encounter we began with.

MOVE CLOSER

The visible outline grows.

MOVE SIDeways

Hidden portions can appear.

TURN THE FRUIT

Another surface comes into view.

Figure 20. Learning how what we see changes. These action-result relations exemplify sensorimotor contingencies. Quotation above: original English wording. [9]

What remains when the light changes?

J. Kevin O'Regan: a surface across different conditions.



1. BESIDE THE WINDOW

The surface receives daylight.

2. UNDER ANOTHER LIGHT

Illumination changes; the fruit remains.

3. TURNING IT

Orientation and reflections change.

Figure 21. One surface, different conditions. Read from left to right: illumination changes, then orientation. Generated illustrations, not measurements of colour constancy. [1, 10]

At the beginning, we saw that colour can remain relatively stable despite changes in light. Now we can ask how O'Regan explains that stability. Moving the apple from the window to a lamp changes reflections and shadows: do you perceive only the light at that instant, or a surface encountered under different conditions?

J. Kevin O'Regan starts from that distinction. His book uses an everyday example: we want to know whether a garment is black or dark blue, so we take it outside the shop. We seek different conditions that let us appreciate its colour. [1]

The apple raises the same question. Its surface absorbs and reflects different components of illumination. Changing the conditions reveals variations related to that same surface. O'Regan proposes studying these relations between surface, illumination and visual capacities, not just an isolated sample of light.

Does this mean we must move the apple every time we see its colour? No. The example makes normally unnoticed relations apparent; it does not turn every colour experience into a deliberate examination. The skills we bring to the encounter also matter.

With David L. Philipona, O'Regan mathematically studied how surfaces transform illumination in relation to human cone responses. They compared those properties with colour judgments. [10] This is a proposal with testable implications, not a demonstration that every question about experience has been resolved.

Can colour appearance change if we alter the relation between what we do and what we see? That question takes us from the apple to an experiment.

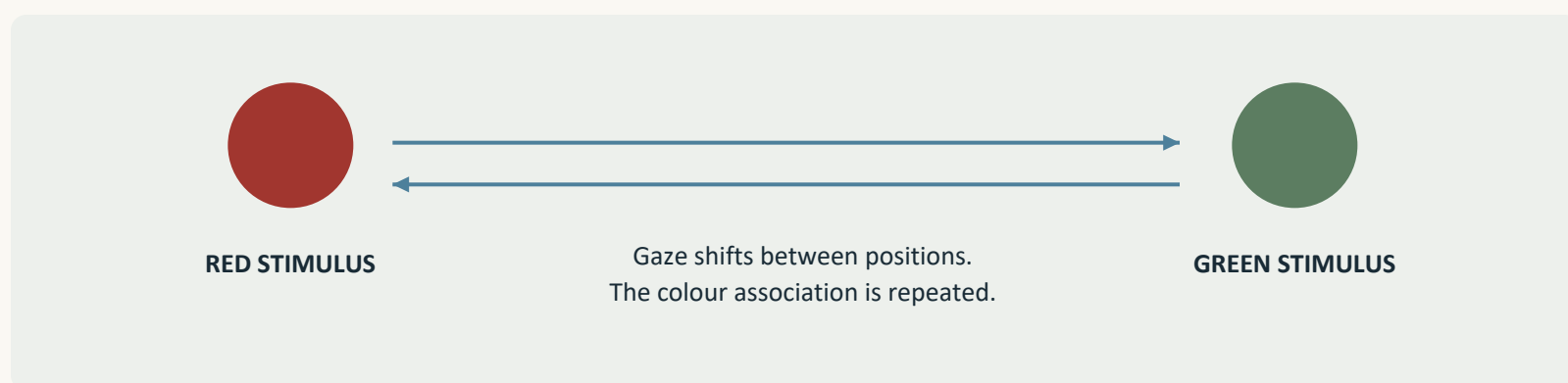
Can a different relation to colour be learned?

From an everyday example to an experimental situation.

So far we have followed everyday examples. To test a relation between action and colour, we must control what changes and measure its effect. Imagine repeatedly associating eye movements between two screen locations with different colours. Will your subsequent colour judgments change?

Aline Bompas and J. Kevin O'Regan investigated this question. After 40 minutes of adaptation, the colour adjustment needed to judge two successive stimuli equal changed. The result depended on the relation to eye movements. [21]

1 / DURING ADAPTATION



2 / AFTERWARDS: COMPARE AND ADJUST

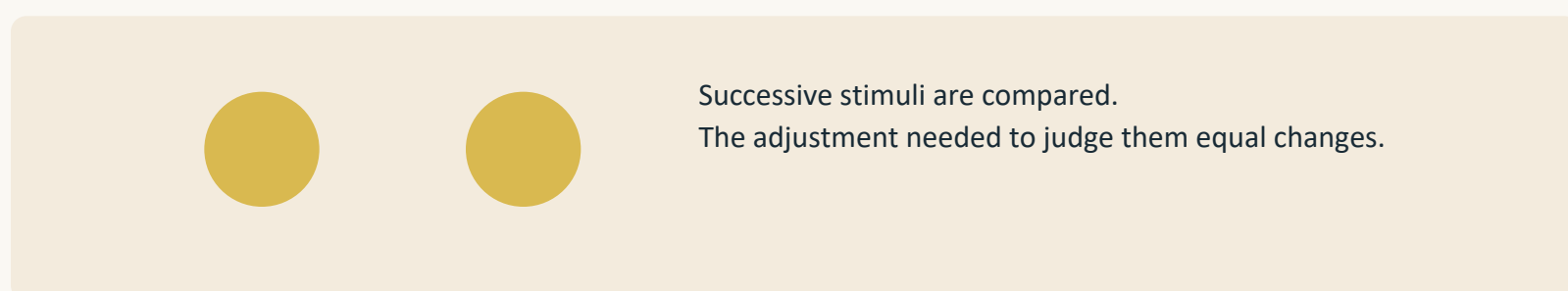


Figure 22. Changing a learned relation and measuring the effect. An outline of the procedure, not an experiment to perform on this page. The lower circles do not reproduce the perceived colour or the size of the effect. [21]

Does this mean any previous experience can make us see any colour? No. The finding concerns particular conditions and a particular task. It supports investigating relations between action and sensory change; it does not establish the whole theory by itself.

We can now sharpen the question about history raised by changing the light: an effect of a particular experience has been measured here. Understanding how it develops requires studying later encounters. The result neither fixes what the person will see forever nor measures colour constancy under every illumination.

But the apple was not just a colour. Let us return to what remained hidden behind the box.

Do you see the whole apple?

What is hidden can be available without already being visible.



1. I SEE THIS SIDE

The box hides part of the fruit.

2. I CHANGE POSITION

The box no longer blocks that part.

3. I TURN THE APPLE

I discover a previously hidden bruise.

Figure 23. The object was present; the detail is discovered. The hidden part is not drawn as transparent. These scenes adapt Noë's argument to an apple; they are not photographs of an experiment. [11]

The box left us with a question: how do you see a whole apple when only part is visible? We already know how movement gives access to new views. Noë goes further: how does that capacity contribute to the object's presence even before you explore it?

Alva Noë develops this problem in *Action in Perception*, using examples such as a tomato and a partly hidden cat. **Perceiving a whole object does not mean having all its parts visible.** Our apple lets us follow the same reasoning. [11]

You know how to approach, walk around the table or turn the fruit to discover other sides. You need not put those possibilities into words. According to Noë, this practical familiarity helps explain why you encounter a three-dimensional object rather than a flat silhouette.

What if you do not move? The account does not require you to keep turning the fruit. Your capacity to access other views also matters. This does not make the back visible: it remains available for exploration that may reveal something unexpected.

The bruise distinguishes presence from knowledge of details. Before you turned the fruit, the apple was already before you, but that mark could still surprise you. Noë's account must explain both the object's presence and the possibility of discovering something new, without granting us a complete inner photograph.

This relation between body and world also has another philosophical history. To understand it, let us leave the table for a moment and turn to Merleau-Ponty and Varela.

A body already involved in a world

Maurice Merleau-Ponty and Francisco Varela



Maurice Merleau-Ponty
1908-1961



Francisco Varela
1946-2001

The Embodied Mind

Francisco Varela
Evan Thompson
Eleanor Rosch

Maurice Merleau-Ponty's *Phenomenology of Perception* starts from our bodily experience of the world. *Phenomenology* carefully studies experience as it is lived. The body is not a container carrying a brain: it is our way of orienting ourselves, reaching things, moving and finding our way around. [12]

At the table, you do not first calculate an abstract map of every joint and surface before reaching toward the apple. The fruit is already encountered from where you sit, at a distance you may be able to cross, among things you can handle. Merleau-Ponty asks us to take that lived situation seriously.

Francisco Varela, Evan Thompson and Eleanor Rosch explicitly drew on his work in *The Embodied Mind*. They called their approach *enaction*: understanding cognition through the activity by which a living being encounters a meaningful world. [13] The apple matters within ways of living, learning and acting; it is not only a set of measurements arriving at a detached observer.

But talking about body and world is not enough to share a theory. *The Embodied Mind* connects cognitive science with phenomenology and Buddhist meditation practices. [13] That project is neither a continuation of Kantor's interbehavioral field nor equivalent to Gibson's ecological approach. Its starting points and methods must be examined separately.

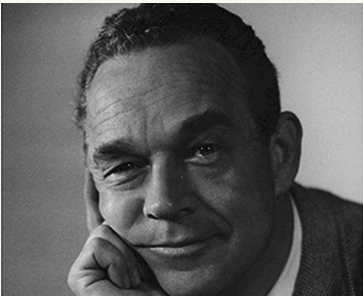
We include it as a contrast, not as confirmation of the other proposals. Nor does Noë's dialogue with enaction make their approaches identical. The following map brings distinct projects together around a question raised by this essay; it does not depict a shared theory or a path of progress from one author to another.

Distinct projects, a comparison

Related questions; different histories and methods.



J. R. Kantor



James J. Gibson



Maurice Merleau-Ponty



Francisco Varela



J. Kevin O'Regan



Alva Noë

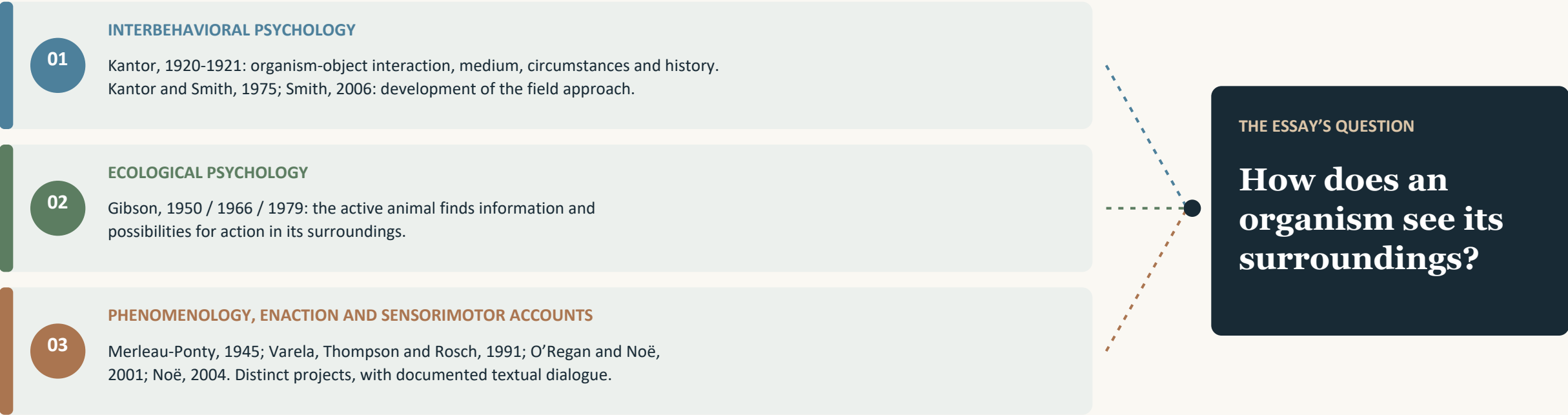


Figure 24. A comparison of projects, not one shared theory. Dashed lines indicate this essay’s comparison, not historical influence. No direct influence of Kantor on O’Regan or Noë is asserted.

Documented connections: Kantor and Smith collaborated. Varela, Thompson and Rosch explicitly drew on Merleau-Ponty. Noë discusses Gibson and enaction. [7, 11, 13]

One apple, three different starting points

The similarities matter, but the theories are not interchangeable.

Ask about the apple	J. R. Kantor	James J. Gibson	J. Kevin O'Regan & Alva Noë
What do we study?	The person's interaction with the apple, including its setting, enabling conditions and history.	What an active observer can discover in the environment.	The practical relationships between movement and sensory change.
What does turning it reveal?	Further qualities become available to seeing and identification within the ongoing interaction.	Further information about the object, available through exploration.	A familiar connection between an action and the resulting change in view.
How does the body matter?	Its biological capacities enable and limit the interaction.	Its size and abilities help determine possibilities such as grasping.	Its skills help explain how further views become accessible.
How does the past matter?	Previous interactions help explain the object's present function for the person.	An observer can learn to pick up relevant information.	Sensorimotor skills can be acquired and exercised.
What is distinctive?	A broad account of psychological events, not only vision.	Emphasis on available information and affordances.	Emphasis on perceptual experience, sensory qualities and practical access.

Table 2. The essay synthesizes the cited works. Similar answers do not show that one theory derives from another. [4-11]

Shared questions do not mean identical answers

A few distinctions keep the comparison honest.

Tradition	What it brings into focus
Interbehavioral	The whole psychological interaction and how its functions develop.
Ecological	Information available to an active animal and possibilities for action.
Sensorimotor	The learned relations between action and sensory change.
Phenomenological	How the world is experienced through a situated, lived body.
Enactive	How meaningful experience and cognition arise through embodied activity.

Table 3. These are distinct emphases, not five interchangeable names for one theory.

The similarities are easier to understand now that each approach has met the same apple. Yet a shared example can also hide disagreements. An affordance, for instance, is a possibility for action relative to an animal. Kantor's stimulus function concerns how an object participates in a particular psychological interaction. The terms overlap in interest, but they are not interchangeable definitions.

Even 'medium' can mean different things. In Kantor's example, light is a medium of visual contact. Gibson discusses air or water as the environment's medium, within which animals move and light travels. Reusing one word does not guarantee that two theories have made the same distinction.

These differences matter when comparing what each proposal explains. But another contrast remains: how does an account emphasizing perceptual hypotheses explain the same scene? Let us return to the apple’s hidden part to compare two answers, not to restart the example.

Is recognizing an object forming a hypothesis?

The same scene lets us compare different explanations.

Earlier we met Gregory's proposal: recognizing an apple from incomplete cues is like forming a hypothesis. Having followed Noë, we can now compare the two without confusing their answers.

Faced with the part of the apple hidden by the box, Gregory would ask which cues and prior knowledge support recognition. Noë would ask how our ability to move closer or turn the fruit contributes to perceiving it as a whole object. [11, 22]

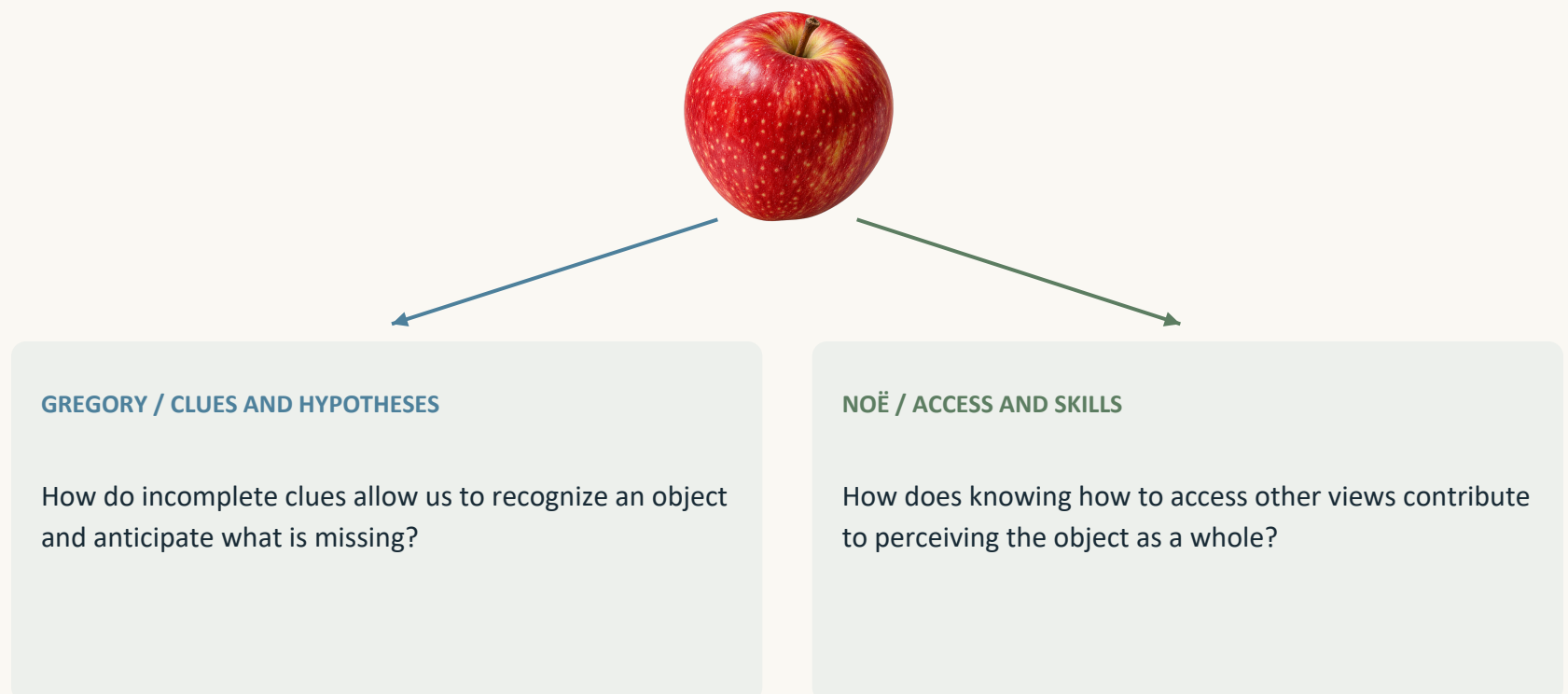


Figure 25. The same scene does not decide between explanations. The essay's comparative application: Gregory does not use our apple here. These are not two stages of seeing or two names for one theory. [11, 22]

Neither says that every hidden detail is already visible. A bruise may surprise us when we turn the apple. The difference concerns the explanatory role assigned to a hypothesis about the object and to practical access to further views.

An illustration can help us understand the dispute; it cannot resolve it. We need arguments and evidence to compare the explanations. Nor is simply opposing 'brain' to 'world' enough: let us see why.

How can we explain the brain's contribution?

From recognizing its necessity to studying its role in seeing.

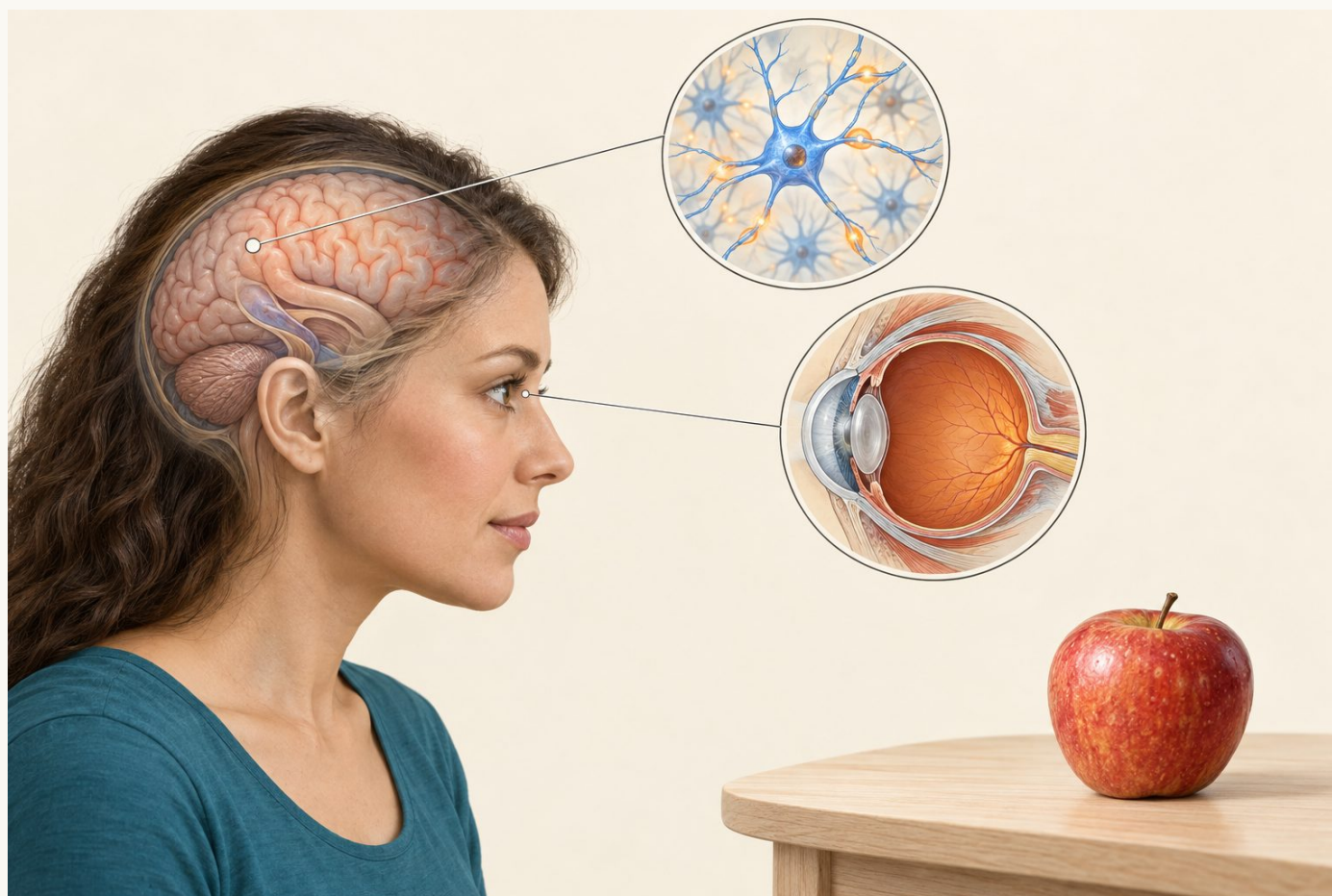


Figure 26. An encounter involving indispensable biological processes. Eye and neuron details are schematic enlargements, not recordings of activity or locations of consciousness. Generated illustration; simplified anatomy and conventional colours. [17, 20]

Following the light into the eye left a question open: how do bodily processes relate to seeing? Smith approached it through the interbehavioral field. Having compared other accounts, we can now clarify the role Noë assigns to the brain and what remains to be demonstrated.

The choice is not between investigating neurons and studying the person. We can relate a cell's response, the organization of brain activity and recognition of the fruit, while clarifying what each investigation explains.

In *Out of Our Heads*, Noë proposes understanding the brain's contribution within the activity of the whole person in their surroundings. On his view, studying the brain is not searching for a small inner spectator, but investigating how it participates in our perceptual capacities. [20]

It remains disputed whether that relation to the surroundings is part of experience or helps cause an experience realized in the brain. To evaluate the answers, we must distinguish what each piece of evidence establishes, without assuming either position in advance.

Necessary does not mean identical

Asking for several explanations does not imply sharing one theory.

Before assessing the evidence, we should avoid a false agreement. From a computational and representational approach, David Marr also distinguishes knowing the machine from understanding its task. To explain vision, he asks what problem is solved, by what procedures, and how these are physically implemented. [23]

Marr is not thereby defending Kantor’s interbehavioral field or Noë’s position. His point is narrower: different approaches can recognize that describing nervous tissue alone does not answer every question. Nor are these levels of explanation equivalent to the physical, biological and psychological areas distinguished at the beginning.

Claim	What are we claiming?
Necessary condition	Normal human vision requires certain nervous-system activity.
Correlation	Brain activity reliably accompanies an experience or a report of it.
Identity	That brain activity is the whole perceptual event. This is an additional claim.

Table 4. Three different claims. Necessity or correlation alone does not establish identity.

The caution also works the other way. The fact that the apple and light are necessary for this encounter does not, by itself, establish that they are parts of experience rather than its causes. That is one of the disputed questions.

Dreams keep the difficulty open: you can dream of an apple without one on the table. And studying the brain does not require assuming an inner photograph or a tiny spectator. These objections deserve serious consideration. [14]

Our journey lets us state the relational proposal more clearly and recognize what it must still explain. Before concluding, let us bring together the steps from the apple in the empty room to the question about seeing it.

What following the apple has taught us

A visual recap before answering what seeing is.

1. DOES THE APPLE NEED SOMEONE TO SEE IT?



No. In the empty room, the apple exists. It exchanges heat with its surroundings and reflects light when illuminated.

We can describe the object and its physical interactions.

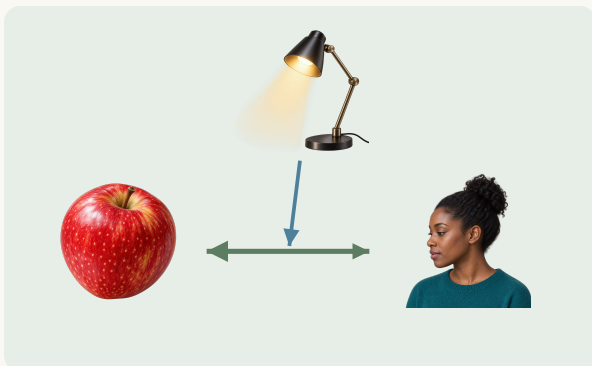
2. WHAT CHANGES WHEN SOMEONE ENTERS AND SEES IT?



Now someone is seeing this apple. Illumination enables visual contact; the person's eyes and nervous system participate.

Our question now concerns a perceptual encounter.

3. DOES LOCATING THE PARTS LOCATE THE SEEING?



We can point to the apple and locate the eyes and brain. But is the whole act of seeing identical with one of these participants?

The relational proposal: study this person seeing this apple, under these conditions.

Figure 27. The question changes; the apple remains. Read downwards: from the object, to the encounter, to a question about what seeing is. The final panel presents a proposal to investigate, not a proof that brain-based accounts are false.

The same apple, different encounters

What we see belongs to a situation and has a history.



THE PERSON

An organism with abilities, a history and a current state.
Response function:
seeing and identifying.

THE CONTEXT

Illumination, other fruit and the people present.

THE OBJECT

The apple being seen.
Stimulus function:
what is seen and identified in this encounter.

Figure 28. A person seeing an apple in a particular situation. Generated illustration, not an experimental record.

Let us return to the apple one last time. We saw that hunger, fullness or discomfort can change our encounter with it. Now let us change something else: what we have just read or what we are doing with the fruit.

What if we have just read the story of Adam and Eve, so often depicted with an apple? The fruit may acquire a meaning it did not have a moment before. Its composition has not changed; the immediate history of our encounter has.

Seeing it on the table is also different from seeing it coming towards us because someone has thrown it. Its trajectory and the possibility of catching or dodging it may now matter. If asked to count apples in a basket, each becomes one unit among others: we need not dwell on the qualities we consider when choosing one to eat.

Searching for an apple is not the same as coming across one unexpectedly. In searching, you scan the table or basket, distinguishing shapes and colours that let you recognize it among other things. When you encounter it unexpectedly, there need not have been a search: it appears during another activity. In both cases you may see and identify it, but seeing differs in its relation to what you were doing and what happens next.

We are not claiming that visual appearance changes in all these situations, or that seeing, wanting, remembering, searching, dodging and counting are one activity. Distinguishing them lets us ask what we are perceiving and how perceiving participates in what we do.

The apple alone does not suffice to describe the encounter. Neither does the person considered separately. The proposal we have explored studies someone seeing something, in particular circumstances and with a history. Asking what seeing is thus leads us to ask what happens between the living being and what they see. Without dispensing with the brain or declaring the debate settled, this is the event we seek to understand.

So, what is seeing?

Six ideas from our journey with the apple.



The organism matters.

Person, dog or fly: the same object need not offer the same perceptual possibilities to organisms with different visual systems and ways of life.



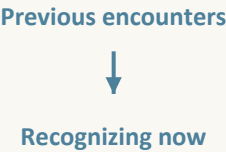
Light makes seeing possible.

What we see depends on illumination and the conditions under which light reaches our eyes.



The apple does not appear in isolation.

The background, nearby objects and situation participate in how we see it.



Seeing has a history.

Previous encounters enable us to recognize and distinguish aspects that might once have gone unnoticed.



Seeing is affected by present circumstances.

The same apple may stand out as something to eat when hungry, a unit when counting, or something to dodge when thrown. Its colour or shape need not change: different aspects and meanings stand out in the encounter.



The brain is necessary, but is describing it enough?

Explaining neural processes is indispensable; the question is whether that explanation exhausts what happens when someone sees something.

We began by asking about an apple and its colour. We end by considering the perceiver, light, surroundings, history and what is happening. The authors do not all understand these elements' participation in the same way. But their proposals invite a broader question: **to understand seeing, is studying what happens inside the organism enough, or must we also study its encounter with the world?**

An unfinished conversation

About the proposal and how this essay was developed.

WHAT THIS JOURNEY PROPOSES

This essay proposes understanding seeing by describing the encounter's organization: its participants, functions, history and circumstances. It does not seek an inner agent to manage it. The work ahead is to specify these relations in concrete situations, test them against observation and acknowledge differences among the authors brought together here.

We do not oppose description and explanation as a matter of principle: a description of functional relations can be explanatory. Readers and those who discuss the proposal must assess how far our account goes.

Nor do we aim to resolve the broader discussion of cognition and consciousness here. Not treating those terms as agents managing the encounter does not deny the phenomena they refer to. That discussion would require a further journey.



Generated illustration of an open dialogue; it does not depict the authors.

How we developed “What Is Seeing?”

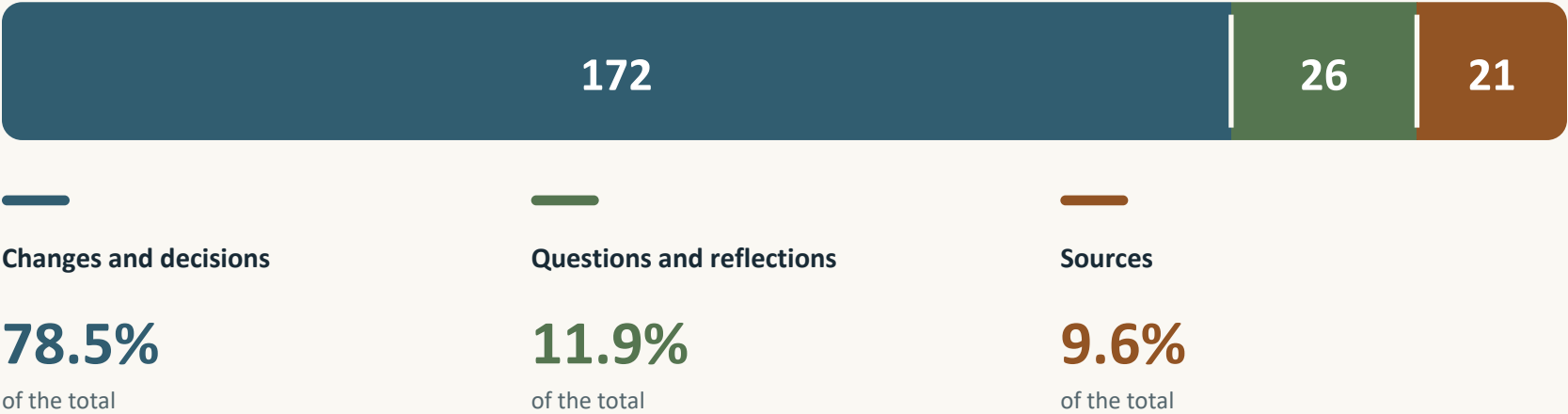
219 substantive interventions · 112 messages

Count through 21 September 2026

This essay grew through a collaborative, back-and-forth composition between **Jorge Campo and ChatGPT**. Jorge suggested authors and readings, contributed ideas and examples, challenged formulations, and requested additions, removals and revisions to passages and images. ChatGPT developed textual and visual proposals that were revised through that exchange.

The result did not emerge from a single request or a definitive answer, but from questions, objections and reworking. We present it as an unfinished conversation: a proposal open to further reading, criticism and ways of understanding seeing.

Type of intervention



Count of requests, decisions, questions and source contributions, not of material changes to the PDF. Excludes 11 coordination items and revisions made after the cutoff.

AN EARLIER IB-LIST EXCHANGE

An earlier thread of this conversation appears in the ib-list debate “Where’s Color?”. The 22 preserved messages in that thread, dated 10–14 July 2001, include contributions from **Dennis Delprato, Richard Marken, Gary Greenberg, Steven R. Brown, Noel W. Smith and Jorge Campo**. On 11 July, Campo distinguished what is necessary for perception from what is sufficient to explain it, proposing perception as an interactive activity rather than locating it simply inside or outside the head. [26]

On 13 July, Noel W. Smith used the stick that appears bent between water and air to emphasize the medium of contact. [27] We revisit these questions not as experimental results or proof of theoretical agreement, but as part of the history of the dialogue.

Sources and quotation locations

Source numbers in the text refer to the works below. Links are clickable.

[1] J. Kevin O'Regan (2011). Why Red Doesn't Sound Like a Bell: Understanding the Feel of Consciousness. Oxford University Press. Chapter 11, pp. 127-134; checked against the supplied EPUB, including the examples and account of adaptation experiments.

[Open source](#)

[2] Jay Neitz, Timothy Geist & Gerald H. Jacobs (1989). Color vision in the dog. *Visual Neuroscience* 3, 119-125.

[Open source](#)

[3] Thorsten Hansen, Maria Olkkonen, Sebastian Walter & Karl R. Gegenfurtner (2006). Memory modulates color appearance. *Nature Neuroscience* 9, 1367-1368. DOI 10.1038/nn1794.

[Open source](#)

[4] J. R. Kantor (1921). A tentative analysis of the primary data of psychology. *Journal of Philosophy* 18, 253–269; especially pp. 257–258 (medium and object) and 261–262 (substitution stimuli).

[Open source](#)

[5] J. R. Kantor (1920). Suggestions toward a scientific interpretation of perception. *Psychological Review* 27, 191-216; especially pp. 195-197.

[Open source](#)

[6] Mitch J. Fryling, Cristin Johnston & Linda J. Hayes (2011). Understanding observational learning: An interbehavioral approach. *The Analysis of Verbal Behavior* 27, 191-203. Discussion of the interbehavioral field, drawing on Kantor (1958).

[Open source](#)

[7] Noel W. Smith (2006). The interbehavioral field. In B. D. Midgley & E. K. Morris (eds.), *Modern Perspectives on J. R. Kantor and Interbehaviorism*, pp. 87-110. Context Press. Quotation checked on printed p. 103; original English wording retained.

[Open source](#)

[8] James J. Gibson (1979). *The Ecological Approach to Visual Perception*. Houghton Mifflin. Especially chapters 5 and 8; chapter 8, 'The Theory of Affordances', was consulted in a reproduced extract.

[Open source](#)

[9] J. Kevin O'Regan & Alva Noë (2001). A sensorimotor account of vision and visual consciousness. *Behavioral and Brain Sciences* 24, 939-973; discussion and response through p. 1031. DOI 10.1017/S0140525X01000115. Quotation checked in the abstract, p. 939; original English wording retained.

[Open source](#)

[10] David L. Philipona & J. Kevin O'Regan (2006). Color naming, unique hues, and hue cancellation predicted from singularities in reflection properties. *Visual Neuroscience* 23, 331-339.

[Open source](#)

[11] Alva Noë (2004). *Action in Perception*. MIT Press. Chapter 1, pp. 1-3 (activity and skills), and chapter 2, pp. 62-64 (perceptual presence and hidden parts). Consulted in the supplied complete PDF. The apple adapts the argument; the book uses a tomato and a cat, among other examples.

[Open source](#)

[12] Maurice Merleau-Ponty (1945/1962). *Phenomenology of Perception*. English translation by Colin Smith. Routledge & Kegan Paul. Part I, 'The Body'.

[Open source](#)

[13] Francisco J. Varela, Evan Thompson & Eleanor Rosch (1991). *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press. Introduction and chapter 8, 'Enaction: Embodied Cognition'.

[Open source](#)

[14] Antti Revonsuo, 'Dreaming and the place of consciousness in nature', pp. 1000-1001, and Geraint Rees & Chris Frith, 'Neural correlates of consciousness are not pictorial representations', pp. 999-1000, in the open peer commentary on O'Regan & Noë (2001).

[Open source](#)

[15] Christopher Schnaitmann, Christian Garbers, Thomas Wachtler & Hiromu Tanimoto (2013). Color discrimination with broadband photoreceptors. *Current Biology* 23, 2375-2382. DOI 10.1016/j.cub.2013.10.037. See also Yamaguchi et al. (2010), Contribution of photoreceptor subtypes to spectral wavelength preference in *Drosophila*, *PNAS* 107, 5634-5639.

[Open source](#)

[16] J. R. Kantor, with the collaboration of Noel W. Smith. *The Science of Psychology: An Interbehavioral Survey* (1975). Interbehavioral.com electronic edition (2024), available as PDF and EPUB; its introduction notes editorial changes and recreated figures. Chapter III, printed pp. 34-50 (behavior segment, functions, medium, setting and reaction systems); chapter X, pp. 160-165 (attention and diagram); chapter XI, pp. 177-184 (perception and its four types). Paraphrases checked against this edition.

[Open source](#)

[17] National Eye Institute (2025, February 18). *Cómo funcionan los ojos [How the eyes work]*. National Institutes of Health. Cornea, lens, retina, photoreceptors and signals to the brain. Used as a source for ocular processes, not as support for the essay's philosophical position.

[Open source](#)

[18] David Lewis (1983). Extrinsic Properties. *Philosophical Studies*, 44, 197-200. Background to the intrinsic/extrinsic distinction. Extrinsic and relational are not simply equated; see the qualification in the following reference.

[Open source](#)

[19] Intrinsic vs. Extrinsic Properties. *Stanford Encyclopedia of Philosophy*, 2023 revision. Introduction and section 2.1. Explains that intrinsic/extrinsic and non-relational/relational are not equivalent distinctions. Here, 'relational' is restricted to the examples of an object's relations with its surroundings.

[Open source](#)

[20] Alva Noë (2009). *Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*. Hill and Wang. Preface, especially p. xiii. Consulted in the supplied PDF; used to present his position, not as evidence of scientific consensus.

[21] Aline Bompas and J. Kevin O'Regan (2006). More evidence for sensorimotor adaptation in color perception. *Journal of Vision*, 6(2), 145-153. DOI: 10.1167/6.2.5. The diagram summarizes the association between eye movements and colours, and subsequent changes in subjective equality settings; it does not reproduce data or effect sizes.

[Open source](#)

[22] Richard L. Gregory (1980/2002). Perceptions as Hypotheses. In Alva Noë and Evan Thompson (eds.), *Vision and Mind: Selected Readings in the Philosophy of Perception*, pp. 111-134. MIT Press. Especially pp. 111-112. Originally published in *Philosophical Transactions of the Royal Society B*, 290, 181-197. The application to our apple is the essay's comparison.

[23] David Marr (1982/2002). Selections from Vision. In Alva Noë and Evan Thompson (eds.), *Vision and Mind: Selected Readings in the Philosophy of Perception*, pp. 229-265. MIT Press. Especially pp. 230-231: different necessary explanations, and understanding a machine versus its task. These levels are not equated with the opening physical, biological and psychological areas of study.

[24] Francis Crick and Christof Koch (1998). Consciousness and neuroscience. *Cerebral Cortex*, 8(2), 97-107. DOI: 10.1093/cercor/8.2.97. Brain-based proposal concerning conscious vision, interpretation of the scene and explicit neural representations. The distinction between biological investigation and biological reductionism is part of this essay's argument.

[Open source](#)

[25] Noel W. Smith (2016). *Myth of Mind*. BookLocker.com. Chapter 2: The Mind-Brain Construct, especially The Brain as a Psychological Organ; Brain as a Necessary But Not a Sufficient Condition; and Levels of Organization or Emergent Property? Source: EPUB supplied by Jorge Campo. Paraphrases of the critique of the brain as agent, representations, and the confusion of necessity with sufficiency; no direct quotations.

[26] Jorge Campo (2001, 11 July). Re: [Ib-l] Where's Color? Email to ib-list (ib-l). Supplied HTML archive: [ibl-color-y-percepcion.html](#). Message distinguishing necessity from sufficiency and proposing an interactive account of perception. A discussion source, not a scientific paper.

[27] Noel W. Smith (2001, 13 July; sender: n.w. smith). Re: [Ib-l] Where's Color? Email to ib-list (ib-l). Supplied HTML archive: [ibl-color-y-percepcion.html](#). Reply concerning the stick seen through water and air and the medium of contact. A discussion source, not a scientific paper.

[28] Andy Clark (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. *Behavioral and Brain Sciences*, 36(3), 181-204. Discusses predictive processing with attention to action and situation; it is not simply equated with Gregory's proposal.

[Open source](#)

[29] Karl Friston (2010). The free-energy principle: a unified brain theory? *Nature Reviews Neuroscience*, 11, 127-138. DOI: 10.1038/nrn2787. The framework includes action, perception and learning; cited as an example of a contemporary family of models, not as evidence that these approaches are identical.

[Open source](#)

Photographs and explanatory illustrations

Portraits are unnumbered; numbered figures are the explanatory visuals.

J. R. Kantor. User-supplied photograph, Kantor ampliada.png.

James J. Gibson. Photograph dated 1955, figure 1 in Brian Rogers (2022), ‘An introduction to the special issue: The ecological approach of James J. Gibson: 40 years later’, *i-Perception*. [Source and credits](#).

Maurice Merleau-Ponty. Wikimedia Commons, Maurice Merleau-Ponty.jpg; credited to Perig Gouanvic / Philosophical Investigations, CC BY 3.0. Reframed for layout. [Source](#); [licence](#).

Francisco Varela. Photograph from the Mind & Life Institute’s [Varela Grants page](#).

J. Kevin O’Regan. KevinPortrait2018.jpg, from [his personal website](#).

Alva Noë. Photograph from [his Berkeley faculty page](#).

Apple and observer scenes. AI-generated, photograph-style illustrations created for this essay. They accompany thought experiments, not controlled trials. The species figure compares known capacities, not subjective experiences. Scenes use different scales; the fly is magnified. Author portraits are authentic photographs, not generated likenesses.

Diagrams and tables. Original explanatory graphics. Arrows in the action figures show the relation between a change and its result. The field diagram depicts the apple and person within relevant conditions. Dashed arrows on the historical map indicate comparison, not influence. The surround demonstration uses identical centre colours.

Portrait tonal adjustments. Gibson: lifted shadows and midtones. Noë: increased contrast. Both use conventional pixel-value adjustments to the source photographs, without generated facial detail.

Light and ocular anatomy. AI-generated illustrations reviewed to explain selective reflection, optical image formation and retinal activity. Rays, tissues and waves are schematic and not to scale. Cell colours are conventional. The retinal optical image is not presented as a solid object or the complete psychological event. Anatomical source: National Eye Institute. [17]

People depicted. Different people appear deliberately across scenes: the argument does not depend on a single identity. Within each controlled comparison, the same visual subject is retained so the changed condition remains clear.

Quotations and translation. Smith’s sentence was checked in his 2006 chapter, printed p. 103; O’Regan and Noë’s in their 2001 abstract, p. 939. Both retain the original English wording. Other descriptions are paraphrases; theoretical comparisons are the essay’s synthesis. This English edition translates the revised Spanish essay; both share the same argument and references.