Why the hard problem of consciousness will never be solved.

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## Abstract

*The purpose of this paper is to argue that (1) that the hard problem of consciousness is concerned with subjective experience; (2) subjective experience arises from the measure of absolute quantities directly by our senses; (3) objective experience, on the other hand, arises from the measure of relative quantities which are invariant to perception; (4) only relative quantities can be shared with others; (5) consequently the hard problem is forever locked inside the head of each individual and can never be discussed, explained or shared with another. (6) Accordingly, no theory can, in principle, be formulated to explain it.*

## What is the problem?

David Chalmers divides the problem of consciousness into the easy problems and the hard problem [1] [2]. The easy problems are not easy in the sense that the answers are obvious or readily solved. Rather they are easy in the sense that there exists, at least in principle, an approach that can be taken and a way they can be solved even if the route is long and tedious. The hard problem on the other hand not only has no obvious solution, it doesn’t even have a suggested mechanism for how it *could* be solved. The conceptual structure to approach the problem doesn’t exist.

The easy problems concern questions such as “How is a particular action explained by neural mechanics?”, “how is behaviour is controlled?”, “how are mental states described?” or “how can we model brain function?” etc. These kinds of problems are open to methodological approach and continue to be investigated. The hard problem of consciousness, says Chalmers, is the inner problem of experience and includes questions such as, “where does the quality of deep blue come from?”, “How do we explain the sensation of hearing middle c?” and “Where does the rich experience of inner life come from?” [1]

These two problem types, the hard and the easy problems, are often confused. There is sometimes a claim to solve the hard problem when all the time it is only the easy problem which is being addressed. Chalmers identifies this confusion and expresses his own frustration at it.

“*It is common to see a paper on consciousness begin with an invocation of the mystery of consciousness, noting the strange intangibility and ineffability of subjectivity and worrying that so far we have no theory of the phenomenon. Here the topic is clearly the hard problem – the problem of experience. In the second half of the paper the tone becomes more optimistic and the author’s own theory of consciousness is outlined. Upon examination this theory turns out to be a theory of the more straightforward phenomena- of reportability, of introspective access or whatever. At the close, the author declares that consciousness has turned out to be tractable after all, but the reader is left feeling like the victim of bait-and-switch. The hard problem remains untouched*.” [2]

This paper is about the hard problem. It has nothing to say about the easy problems but what it does say is not encouraging or hopeful. The claim here is that the hard problem is intractable and will forever remain intractable. It is intractable in the sense that it is impossible to make experience objective and if it cannot be made objective it cannot be shared with another and cannot be the subject of dialogue, discussion or theory because a solution is impossible in principle. It is locked inside the head of each individual and can never be released. We argue that the only things which can be objectively known are the relationships between things. The hard problem is not about the relation between things but “things as they are” and these are absolutes which cannot be objectively known.

# 1. The hard problem of consciousness is concerned with subjective experience.

## The Hard Yellow Problem

I am going to restrict my discussion about the hard problem to the realm of seeing. I am doing this partly because the sense of sight is the most immediate to us and most intuitively understood and partly for reasons of simplification. It should not be difficult to see how the argument could apply to the other senses. It is a sub-problem of the hard problem which has all the qualities of the hard problem but makes the issue a little more concrete and specific for us.

I call this specific form of the hard problem, “The hard yellow problem”. You sit in front of a yellow wall that stretches as far as you can see in every direction. All you can see is yellow. The sensation of yellow floods your visual senses and yellow is all that you experience. The hard yellow problem asks; “Where does that experience of yellow come from?”

We know from physics that outside our brains, in the real world[[1]](#footnote-1), light is composed of electromagnetic waves. Some have a longer wavelength which corresponds to red and some a shorter wavelength that corresponds to violet and some a middle wavelength that corresponds to green. And all the colours between are associated with wavelengths of the light wave. And physics tells us that is all there is: waves of electromagnetic radiation. The light from our yellow wall corresponds to electromagnetic waves with a wavelength of around 570nm. Many different wavelengths hit the wall, and most of them are absorbed. The ones that are reflected back into your eye are 570nm so when you see them, they appear only yellow.

But a wavelength is not yellow. Wavelengths have no colour. So where does the yellowness of yellow light come from? The wave of 570nm enters the eye, is refracted by the lens where it is brought to focus on the retina and it impinges on the three cone receptor cells each reacting to different wavelengths of light. The green and red cone sensors are activated and produce electric impulses which are fed via optic nerves to neurons in the brain. The brain then combines these electric impulse in such a way as to register as yellow light. But where along this pathway did the electromagnetic wavelength of 570nm turn into the experience of yellow? There is no yellow in the 570nm waves, nor in the lens nor the retina nor in the cone receptor cells and neither can the electric impulses fed to the brain be said to carry yellowness. So where does the sensation of yellow come from? Somehow it is constructed inside the brain in a way that we don’t understand. All we can say is that at some point the brain turns these electric signals into a sensation of ‘seeing yellow’.

There is no colour in the real world. When I see yellow I have a sensation. When I see green, there is yet another sensation. These sensations are in my mind. There is no colour outside our mind. The outside world is just wavelengths of electromagnetic radiation. Each person manufactures their own colour and we don’t know how. However the problem is deeper than this.

# 2. Subjective experience arises from the measure of absolute quantities directly by our senses.

## Your yellow is not my yellow.

If each individual consciousness constructs their own yellow, how can we be sure that the yellow that I perceive is the same as the yellow that you perceive? Since we do not know how you construct yellow you can’t be sure you are seeing the same yellow as I am. It’s possible that what you experience as yellow, someone else experiences as red or something wholly different. This problem was discussed by John Locke.

That the same Object should produce in several Men's Minds different Ideas at the same time; v.g. if the Idea, that a Violet produced in one Man's Mind by his Eyes, were the same that a Marigold produces in another Man's, and vice versa. For since this could never be known: because one Man's Mind could not pass into another Man's Body, to perceive, what Appearances were produced by those Organs; neither the Ideas hereby, nor the Names, would be at all confounded, or any Falsehood be in either. [1]

Locke is very clear that not only do you not know if someone sees the same yellow that you do, but it is worse than this; you cannot know, not now, not ever. It is not possible in principle any more than it is to put your mind inside another person’s head, because that is what you would have to do to find out.

There is a well-known thought experiment that brings this home clearly [2]. Imagine that you wake one morning to find that all the colours you perceive have been inverted. What was red now appears violet, what was orange now appears blue etc. Every colour has been mapped onto its opposite colour. Nothing else has changed, only your perception. This is called intra-subjective spectrum inversion because it happens inside the mind of a single person. The only thing which tells you that a change has taken place is your memory of how things used to be and how that differs from how they are now. Provided that the mapping from the old spectrum to the new spectrum is one-to-one or bijective then there is no way to determine any difference between the two. There is no other way of determining the change other than your memory of how things used to be. So it might not be a change of perception that you are experiencing it is possible it might only be a change of memory. If your memory had changed along with your perceptions, you wouldn’t notice any change at all. If on the other hand your memory only had changed, then you would think it was your perception of colours that had changed. You only have your initial internal state to compare with your final internal state. There is nothing external that you can check against. So it is an entirely subjective experience and you depend upon memory to compare your previous state to your present state. If you had a different memory then you would notice the difference in perception because your memory alone would tell you it is different.

## The absolute undetectability of isomorphic mappings

But having a different memory is no different from being another person with another memory. Different people have different memories and so are just as likely to perceive different colours to you for the same electromagnetic wavelength. And provided the change is isomorphic – one-to-one - where one colour maps only on to one other colour – then we cannot know in principle there was any difference. This means that the perception of colour is an entirely subjective experience in that it cannot be shared with any other individual for the reason Locke gives; “*because one Man's Mind could not pass into another Man's Body, to perceive, what Appearances were produced by those Organs*”.

One might naturally wonder why we are not able to pin down where the yellow experience comes from. Why is this such an intractable problem? We propose here that the reason is very simple. It is only possible to share relative values because only relative values produce objective experiences. It is not possible to share experiences because they are derived from absolute values. We cannot share subjective experiences and we never will. It is not possible in principle.

# 3. Objective experience arises from the measure of relative quantities which are invariant to perception.

## Constructing the Objective from the Subjective

The subjective world is that which we perceive directly, is particular to ourselves and cannot be shared with anyone else. The objective world is perceived by all, can be shared with others and can be communicated unambiguously. How these two are connected and whether the gap between perception of the world and the reality of the world can ever be bridged has been subject to doubt ever since David Hume [2]. Since all our knowledge starts from our perceptions and everything we know comes from our senses, Hume says, we can know nothing about the external world; we know only our senses. George Berkeley [6] [7] makes the case stronger and says we are locked into a subjective world from which we can never escape and from which only the mind of God can rescue us.

However, the gap between perception and reality can be crossed and it is quite possible to construct an objective world out of subjective perceptions. I contend it is the existence of relative quantities which give rise to objective states and absolute quantities give rise to subjective states. To see this we need to look more closely at what it means to be ‘objective’.

## Transitive and Objective

The meaning of the word ‘objective’ is not always clear for it means many things to many people[[2]](#footnote-2). It is essential then to tighten the definition of ‘objective’ and make it operational so that it can be cast in a form that is measurable and thereby unambiguous. We propose to do this by defining the alternative term ‘transitive’ in a precisely definable way and show that it determines ‘objective’ in a precise way.

I use the word ‘transitive’ to mean that which can be transferred between observers unambiguously and without change. Transitive knowledge is therefore agreed knowledge, which can be shared between all observers and does not depend on a particular point of view. Consequently transitive knowledge forms the building blocks of that collective body of knowledge that we might call science or objective knowledge. In this way I claim that transitive is the core property of ‘objective’ in the sense that it is the foundation of the independence of objective knowledge. I propose therefore to distinguish two kinds of knowledge; ‘transitive knowledge’ which can be shared unambiguously and ‘intransitive knowledge’ which is peculiar to the individual observer and cannot be shared.

Intransitive knowledge is the knowledge that Hume and Berkeley discussed when trying to arrive at a solution of how empirical knowledge could form the basis of anything other than subjective impressions. Transitive knowledge, on the other hand, arises from the invariants of perception. Being an invariant it is observer independent and therefore transitive knowledge can be shared and agreed among observers and talked about in an unambiguous way.

Transitive knowledge can be formally defined as that knowledge which can be shared between observers without any change or alteration. This might be expressed for two observers $O\_{1} ,O\_{2}$ independently observing phenomena $r\_{i}$ as

$\begin{array}{c}O\_{1}\left(r\_{i}\right)=O\_{2}\left(r\_{i}\right) \#\left(1\right)\end{array}$

Or in other words two observations by two independent observers are equal. This relation defines a transitive observation. The corresponding relation defines intransitive:

$$\begin{array}{c}O\_{1}\left(r\_{i}\right)\ne O\_{2}\left(r\_{i}\right) \#\left(2\right)\end{array}$$

This represents the situation where one observer’s perception of phenomena $r\_{i}$ cannot be equated with another observer’s perception of the same phenomena.

## 3.2 Invariants of Observation

Having defined the term ‘transitive’ it is now necessary to discuss whether transitive knowledge actually exists and how invariants of observation come about. I set this out more fully in the paper “Constructing the Objective World from Subjective Perceptions” [4] Briefly the argument is this. There are real things which are independent of our perceptions and we can share our knowledge of them explicitly and objectively without having them tainted by the subjectivity of perception. They consist not of ‘things in themselves’ but in the relation of things to each other. [5] It is relative quantities which are independent of our perceptions. Relationships between things are transitive, while things in themselves are intransitive. Relative quantities are invariants of perception and we use them to construct the objective world. It is these invariants which form our “transitive knowledge” and so they are unambiguously sharable with others. It is therefore from relative quantities that we can construct an objective world.

To give some idea of why this might be so, consider first the absolute quantities which are known through direct perception via our senses. For instance we might use our ears to detect a musical sound or we might use our eyes to determine colour. What we perceive is an absolute quantity with no relative component to it. This direct perception of a sound or a colour ensures that it remains locked up inside our mind because it is an absolute value and absolutes are intransitive. It is this which lies at the heart of the hard problem. For instance we can weigh a bag of sugar by holding it in our hand and perceiving the weight directly. We call it light or heavy according to our direct sense of its weight. But one person may call it light while another calls it heavy. The absolute weight is a subjective quantity which cannot be agreed upon. But given two bags of sugar, one heavier than the other, then all can agree the relative difference in weight. All observers will come to the same conclusion that this bag is heavier than that bag[[3]](#footnote-3). This relative judgement is agreed by all and therefore is transitive knowledge from which we construct our understanding of the objective world. The problem of subjectivity only exists for absolute quantities such as colour and this is the cause of our hard yellow problem.

## Relative quantities are invariants of perception.

Absolute quantities may vary with each observer, but relative quantities are fixed by their relation to each other. It is well known that relative quantities are invariants while absolutes are not. For example absolute quantities vary under multiplication, but ratios are invariant under multiplication and relative differences are invariant under addition. See Figure 2 Relative Invariance.

**Ratio invariance under multiplication of a constant**

$A ×constant =B$ (Absolute quantities change)

$\frac{A×constant}{B×constant}=\frac{A}{B} $ (Relative quantities are invariant)

**Difference invariance under addition of a constant**

$A+constant =B$ (Absolute quantities change)

$A-B=\left(A+constant\right)-\left(B+constant\right)=A-B$ (Relative quantities are invariant)

Figure Relative Invariance

It is this invariance under an application of scale magnitude which gives rise to transitive knowledge and the invariant quantity we can transferred between observers without change allowing them to speak about the same things.

One last thing that that needs to be made explicit before we turn back to the Hard Yellow Problem is that the expression of relative quantities requires the specification of at least two phenomena in relation to each other, whereas the expression of absolute quantities requires only one.

$$Absolute\begin{array}{c}O\left(r\_{i}\right) \#\left(3\right)\end{array}$$

$$Relative\begin{array}{c}O\left(r\_{i},r\_{j}\right) \#\left(4\right)\end{array}$$

If we turn back to our Hard Yellow Problem, we can see that although yellow is a subjective perception of an absolute value, we can find objective perceptions from relative values. Consider an RGB colour space C and assume two points in the space represent two colours; call them yellow Y and blue B (See Figure 3). We say that the $r\_{y}$ vector represents the perception of yellow and the $r\_{b}$ vector represents the perception of blue.

**Y(yellow)**

**rb**

**S**

**C**

*R*

*G*

*B*

**ry**

**B(blue)**

Figure Yellow and Blue identified in Colour Space C

Whereas the $r\_{y}$ and $r\_{b}$ vectors each represent absolute colour values, the difference between the vectors is a relative displacement vector $S$

$$S=r\_{y}- r\_{b}$$

The value of $S$ represents the difference between blue and yellow. This displacement vector $S$ is a relative quantity which is independent of the coordinate system unlike a single point C or B which is dependent on the coordinate system.

Now consider how the colour Y looks from the perception spaces of two observers $O\_{1} ,O\_{2}$.The perception of yellow by observer $O\_{1} $is given by $O\_{1}\left(Y\right)$ and the perception of yellow by observer $O\_{2} $is given by $O\_{2}\left(Y\right)$ and in general:

$$\begin{array}{c}O\_{1}\left(Y\right)\ne O\_{2}\left(Y\right) \#\left(2\right)\end{array}$$

This is the equation of non-transitive observations which holds for absolute values. Direct perceptions of colour are non-transitive which means that we can never share the experience of colour with another person.

Consider now the relative distance between two points Y and B given by the displacement vector S (See Figure 4). This displacement vector is independent of the perception space coordinate system. From the perception of observer $O\_{1}$ the displacement vector $S$ is given by

$$S= O\_{1}\left(Y\right)- O\_{1}(B)$$

From the perception of observer $O\_{2}$ we have

$$S= O\_{2}\left(Y\right)- O\_{2}(B)$$

However we know that

$$O\_{1}\left(Y\right)=O\_{2}\left(Y\right)+R$$

$$O\_{1}\left(B\right)=O\_{2}\left(B\right)+R$$

Where $R$ is the unknown vector that relates the two observers. Therefore

$$O\_{1}\left(Y\right)- O\_{1}\left(B\right)= (O\_{2}\left(Y\right)+R)-(O\_{2}\left(B\right)+R)=O\_{2}\left(Y\right)- O\_{2}\left(B\right)$$

Which means that the perception of the difference in colours is the same for both $O\_{1}$ and $O\_{2}$. This holds no matter what the value of $R$ or whether we even know $R$ or not. $R$ represents the relationship between the two observers, and we don’t need to know what that relationship is in order to conclude that they perceive the same relative differences.

*X1*

*Y1*

*Z1*

*Z2*

*X2*

*Y2*

**S**

**O1(B)**

**R**

**O1**

**O2**

**O1(Y)**

**Y**

**B**

**O2(B)**

**O2(Y)**

Figure A relative displacement S is independent of the coordinate system.

The perception of the colour displacement vector is the same in both perception spaces. The implication is that relative changes in colour are perceived the same even though absolute colour is not. It is the relative quantity which is invariant to both observers’ perceptions. Note that we are not saying that each person perceives the same yellow or the same blue. Clearly, they do not because

$$O\_{1}(Y)\ne O\_{2}\left(Y\right)$$

$$O\_{1}(B)\ne O\_{2}(B)$$

What we are saying is that the displacement vector S is perceived the same by all. This is the invariant of perception and represents difference in colour which is perceived the same by all, whereas absolute colour is not. As we say elsewhere:

*That means that we now have an object which can be perceived in a way that we know it is perceived the same by someone else. We have in effect been able to pass “*one Man's Mind….into another Man's Body*” – not literally but effectively because we know that what appears in one man’s mind is exactly the same as what appears in another man’s mind. These ‘transitive’ quantities which are independent of perception are the elements from which we construct the objective world.* [4]

# 4. Only relative quantities can be shared with others.

## Absolute Values are Subjective, Relative Values are Transitive.

I have now been able to answer the question posed in section 3.2 about whether transitive knowledge exist and I have demonstrated that it does so in the form of relative quantities. I am now in a position to update (1) and (2) to show that for any pair of observers $O\_{n} and O\_{m} $relative quantities $\left(r\_{i},r\_{j}\right)$ are transitive.

$$\begin{array}{c}O\_{n}\left(r\_{i},r\_{j}\right)=O\_{m}\left(r\_{i},r\_{j}\right) \#\left(1\right)\end{array}$$

Whereas absolute quantities $\left(r\_{i}\right)$ are intransitive.

$$\begin{array}{c}O\_{n}\left(r\_{i}\right)\ne O\_{m}\left(r\_{i}\right) \#\left(2\right)\end{array}$$

Absolute quantities are apprehended through an input directly into the sensing organ. The stimulus to the senses, like the brilliance of the light affecting the eye, or the weight of an object in our hands or the smell of a rose, generates an absolute value which is gauged only by our senses. The value is intransitive which means it is subjective. The brightness of a light may be intense for one person or dim for another. A sound may be considered loud by one while another considers it soft.

Relative quantities are different. They are not apprehended by the sensing organs directly. They are constructed from a comparison of direct perceptions and that comparison is not performed by the sense organ. The relative comparison is made outside the organ, standing above perception, and compares the output of the organ with another output. When seeing a colour none can be sure they see the same colour but when comparing one colour with another or one light intensity with another intensity, all can agree the relative difference between them; this light is brighter than this, this sound is louder than that. Relative differences are transitive between observers while absolute values are not. The sharing of unambiguous knowledge is built on the primacy of relative differences. This knowledge can be made precise and relative measures can be formalized is by the introduction of a scale.

## Scales – formalizing relative measurements.

Using only our senses to assess the brightness of a lamp or the weight of a bag of flour leaves us with a subjective feeling that doesn’t have any validity with others. If you went to a shop for 5 pounds of vegetables, you would not be happy to accept the grocer’s assessment of the weight simply by his picking up the bag and telling you it felt like 5 pounds to him. When we want a more objective measure, we usually use a scale. To assess weight we construct a balance and measure the weight relative to a scale. Direct comparisons of relative weights can be made arbitrarily precise by the use of a balance that sets one weight against another. That way we construct a measure which is repeatable and transferrable. The scale is a tool which replaces the absolute with the relative and hence the subjective with the objective. The way it does this, in principle, is using a pointer which moves against a set of graduated lines – the scale. This provides a relative measure where all values are related back to an origin. A value of 4, for instance is the distance from the zero to the pointer - a relative value. All measurement takes this basic form even though scales have become more sophisticated with digital read-outs and other forms of electronic measurements. They are all primitively based on the pointer and the scale even if these are abstracted All scales are mechanisms for systematizing relative measurements. The use of the scale produces an observational invariant that can be shared with others. The scale’s fundamental property is the creation of transitive values and by sharing the scale we share the value unambiguously.

# 5. Consequently the hard problem is forever locked inside the head of each individual and can never be discussed, explained, or shared with another.

The perception of yellow is an intransitive quantity. That means it cannot be shared with anyone else. Even if we could understand the mechanism that creates the colour yellow, and even if we can pin down the very physical process in the brain that gives rise to it, nevertheless the perception of yellow can never be shared. Colour perception is forever locked inside the head of the observer and can never escape. Observers can agree that there is a difference between yellow and blue, they can agree that one light is brighter than another but they cannot agree that they see the same yellow as another. As we saw in (2)

$$\begin{array}{c}O\_{1}\left(Y\right)\ne O\_{2}\left(Y\right) \#\left(2\right)\end{array}$$

The reason we are stuck in the world of subjectivity is we are stuck in a world of absolute values; we have no relative values to transfer to others. Some things cannot be converted into relative values while some can. Phenomena can be set against other phenomena and the relationship between the two used to create a quantity which can be shared. But the phenomenon alone, without reference to anything else, does not and cannot have those transitive qualities. Those things which cannot be converted to relatives are absolutes like the perception of colour yellow.

# 6. Accordingly no theory can, in principle, be formulated to explain it.

Intransitive knowledge by definition cannot be transferred to anyone. That mean we cannot talk about them, we cannot share them, we cannot discuss them. We cannot put together theories about them or set up experimental procedures to measure them. We cannot learn about them or understand them except from the vantage point of inside our own brains. This is what intransitive means. And the absolute quantities of our sense impressions are locked away inside ourselves. This is why we have had to construct secondary quantities from primary sense impressions. We have had to construct relative quantities in order to have a language which we can objectively transfer invariable quantities to one another. Elaborate procedures have enabled us to construct and share scales, ratios, differences and build a world out of relationships. If you could explain where yellow perception comes from it would only apply to one individual. It cannot apply to all because it is subjective and can never be made objective. That means you cannot have a description of all peoples experiences of this yellow and that means you cannot have a theory about it or even communicate it to others.

## The Reason the Hard Problem will never be solved.

The hard problem is insoluble because to solve it requires the sharing of absolute values which by their very nature cannot be treated objectively. Relative quantities we can share, absolutes we cannot. Relative we can measure, Absolute cannot be measured. There can never be a theory of colour that can be shared with anyone else and there can never be a theory of the hard problem. So the hard problem will never be solved.

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1. I am taking a position of realism where I am assuming the existence of a real objective world that is independent of our perceptions. If you have a different view from this, what I say may still apply in your case, even if you think it doesn’t. But then that’s the problem with subjectivism isn’t it? [↑](#footnote-ref-1)
2. The Shorter Oxford English Dictionary lists 9 meanings for Objective. [12] [↑](#footnote-ref-2)
3. Of course if the difference in weight is only slight then there might be differences of opinion but that is not the issue here. We are making the case that objective measures can be made from subjective perceptions by using relative quantities. The difference can be made arbitrarily large so that the relative difference is undeniably for two independent observers. It is these cases of substantial relative difference which opens the door to the objective world and denies Hume his scepticism. [↑](#footnote-ref-3)