

Proprioception, Anosognosia, and the Richness of Conscious Experience

Alexis Elder

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Abstract

Proprioception, a sense of bodily position and movement, is rarely the focus of conscious experience. If we are ordinarily conscious of proprioception, we seem only peripherally so. Thus, evidence that proprioception is present in the periphery of at least some conscious experiences seems to be good evidence that conscious experience is fairly rich. Anosognosia for paralysis is a denial of paralysis of one's limbs, usually in the wake of brain damage from stroke. Because anosognosic patients overlook their paralysis, anosognosia seems to be a counterexample to the claim that proprioception exists in the periphery of conscious experience. However, careful consideration of the data shows that anosognosia makes a poor counter-example to a rich theory of consciousness. Thus, we retain reason to believe that proprioception exists in the periphery of conscious experience, and so to conclude that conscious experience is relatively rich.

1. *Introduction*

Proprioception, a sense of bodily position and movement, is rarely the focus of conscious experience. Thus, when we have evidence that proprioception is an ordinary part of conscious experience (as discussed in Ford and Smith, 2006), that seems to be good evidence that conscious experience is fairly rich. But the apparent presence of proprioception in

conscious experience may be subject to counter-examples. Anosognosia for paralysis is a denial of paralysis of one's limbs, usually in the wake of brain damage from stroke. Because anosognosic patients overlook their paralysis, anosognosia seems to be a counterexample to the claim that proprioception exists in the periphery of conscious experience. However, careful consideration of the data shows that anosognosia makes a poor counter-example to a rich theory of consciousness. Thus, we retain reason to believe that proprioception exists in the periphery of conscious experience, and so to conclude that conscious experience is relatively rich.

How rich is ordinary conscious experience? Advocates of rich theories of consciousness hold that conscious experience is 'thick': we are conscious of quite a lot, including both a focus of attention, and a variety of features in the periphery of attention. Advocates of 'thin' theories of consciousness, by contrast, hold that the apparent richness of conscious experience is an illusion. They argue that we assume and fill in detail as attention skips from object to object, with little to no room for peripheral attention. Assessing the true scope of conscious experience is difficult to research, because many ways of measuring it at least partially consist of asking the research subject for reports on content of experience, which requires the subject to attend to the very stimuli whose presence in the periphery is contested. One way around this problem is to check for what can roughly be characterized as change blindness: if a component of the scene changes, do subjects notice the difference? If the subject fails to notice the change, this supports a thin view of consciousness. If the reverse, richer theories of consciousness gain support.

Change-blindness tests of various sorts are occasionally criticized for offering support for thin accounts of consciousness that does not hold up across scenarios or under scrutiny (Clark 2008, 143-146). Furthermore, Clark and other advocates of extended mind have, to some degree,

reconceived the thick/thin consciousness debate on the grounds that it fails to take into account the degree to which experience unfolds via active engagement with the world. However, where change-blindness tests show that subjects notice changes to phenomena previously thought to be subconscious, they still seem quite informative about constitutive elements of our perceptual experiences, which can contribute to even a revised account of the debate, as Clark proposes.

A great deal of attention has been focused on vision in researching the normal scope of conscious experience. But proprioception, roughly defined as a sense of one's own bodily positions and movement, makes another and less-explored field of inquiry, and one of interest wherever one falls on questions about the extension of mind, because what is at issue is not awareness of (what is often thought to be) one's *external* surroundings, but of oneself and one's conscious experience of embodiment.

The neurologist Oliver Sacks claims that proprioception is, under ordinary circumstances, 'unconscious' and 'automatic,' and argues that 'in normal situations, [proprioception] simply do[es] not exist' for the subject. (1985, 72) This is consistent with a relatively 'thin' theory of the content of consciousness. 'Yet,' notes Sacks, absence of proprioception 'can be quite conspicuous.' (1985, 72) If something interrupts the normal stream of proprioceptive information, 'then experience is profoundly strange, an almost incommunicable equivalent to being blind or being deaf.' (1985, 72) If we miss proprioception when it is gone, then perhaps Sacks has been too hasty to label it 'unconscious.' He asserts that we are not entirely blind to changes in proprioception. This is potentially in conflict with his claim that proprioception is unconscious. If damage to proprioceptive nerve fibers causes a change to conscious experience noticeable to the subject, then this seems to indicate that proprioception contributes to ordinary conscious experience, either directly or indirectly, without being the focus of attention. At

minimum, as Sacks notes, we are aware of drastic changes in proprioception, as when we lose proprioception entirely through nerve damage. (Sacks 1985)

This consciousness of change in proprioception may be evidence that proprioception contributes to the character of conscious experience. There is, though, another reason we might notice a lack of proprioception, which must be ruled out before concluding it is in the periphery of consciousness. Proprioception plays an important role in how we regulate and control body posture and movement. Perhaps we notice its absence for its instrumental role in movement, particularly when we move and act in ways that ordinarily involve proprioceptive feedback. But use of this feedback could nonetheless be automatic and subconscious; we might never be conscious of proprioception even though we are aware of its effects. If that were the case, then we would only miss proprioception for its utility. If we are to use a change-blindness test to check for the peripheral presence of proprioception in ordinary conscious experience, then, a simple test for change-blindness will not be sufficient. Instead, we must ask whether we only miss it because of changes to the character of conscious experience, indicating that it plays a constitutive role in such experiences, or if we miss proprioception when we go to use it, only to find it is not available.

Ford and Smith (2006), arguing for a rich conception of consciousness, propose that, to address this challenge, we focus on the question: does the absence of some input affect *all* of our conscious experience (or at least, more than is useful), or just the experiences that require it? A thin theory of consciousness predicts that, given changes to normal proprioception, we should notice the effect (difficulty moving), rather than the cause (the missing or changed information stream). If, on the other hand, we find that conscious experiences change in character when proprioceptive nerve signals change or disappear, even without bodily movement, then that

seems to support the theory that we are ordinarily conscious of proprioception, to at least a small degree. Note that proprioception is an excellent test subject for the richness of consciousness because it seems reasonable to think we are only peripherally conscious of it most of the time, if at all. Few people seem to be explicitly aware of it (or even know what to call it). Thus, evidence that proprioception is a normal component of conscious experience *prima facie* supports a rich account of consciousness.

Even if conscious experiences vary from context to context or subject to subject, so that results of one investigation cannot be assumed to describe all subjects' conscious experience equally well, we still face the question, over what range do conscious experiences vary? Are they (relatively) thick or thin? Again, proprioception makes an especially interesting test case for this question because it is clearly not the focus of most people's ordinary conscious experiences. Evidence that it plays any role at all for people is evidence of how rich conscious experience can be.

Ford and Smith distinguish 'peripheral contribution to consciousness' from subconscious information streams under ordinary circumstances as follows:

First, imagine a person who is lost in thought and not paying a bit of attention to what she is looking at. If that person were suddenly struck blind, she would notice the change.

From this, we may conclude that visual experience was a part of the person's conscious state, even though it was not what she was attending to. Second, imagine a person lost in a pitch-dark coal mine. If that person were struck blind, she would not notice. Visual perception was not a part of that person's conscious state in the mine. (Ford and Smith, 2006, 367)

If some input stream is missed whenever it is gone in at least some ordinary (for example,

non-coal-mine-exploring) conscious experience, then that should count as evidence that it is present in the periphery of at least some ordinary conscious experiences. If we can demonstrate that proprioception is both peripherally present for some ordinary conscious experience, and yet we have good reason to think it is ordinarily *only* available in the periphery of consciousness, then this supports at least a moderately rich view of consciousness.

Granted, this test is not a terribly fine-grained measure of the extent of consciousness. It tests merely for the constitutive role of a modality in conscious experience, and not necessarily of particular inputs in that sensory mode. However, it offers an interesting opportunity to test whether a feature is dimly versus not present, typically a challenging question to investigate (as Hurlburt and Schwitzgebel 2011 have recently noted). Proprioception avoids some of the focus and reportability problems of inquiries into the scope of consciousness in the visual field and some of the introspective reports cited by Hurlburt and Schwitzgebel. With proprioception we do not ask patients to attend to features or introspect to report on them, but rather, given observable damage to the nervous system or neurological damage, see whether people report changes to the character of their experiences. Ford and Smith (2006) argue that one of Oliver Sacks' patients provides evidence that proprioception is a component of conscious experience, despite Sacks' claim that proprioception is unconscious under ordinary circumstances. Sacks' patient Christina was a twenty-seven-year-old woman who suffered from a form of polyneuritis, inflammation of the peripheral nervous system, that left her proprioceptive nerve fibers permanently damaged, although nearly all her other senses, including light touch, remained more or less intact. Without proprioception, her movements were erratic, and she was unable to sit up or maintain posture or facial expression without visual attention. When she sat in front of a mirror, she could monitor herself and her movements visually, and so control them, but when she closed her eyes or looked

away, her control would vanish. She would lose her hands when she was not looking at them, and would have to search for them visually to regain control. (Sacks 1985)

2. *Evidence of Peripheral Presence of Proprioception*

All of the symptoms described so far might conceivably be consistent with either a rich or thin view of conscious experience, since the experiences associated with the symptoms noted above could be purely instrumental effects of the lost nerve signals. But, above and beyond her mobility challenges, Christina reported she felt ‘disembodied.’ The character of her conscious experience had changed. (Sacks 1985) Ford and Smith (2006) take this report of a feeling of disembodiment as evidence that a noticeable change has taken place in the quality of conscious experience. This indicates that missing proprioception is noted by the patient when it is gone, they conclude, not only when it was useful. That is, once proprioception was eliminated via nerve damage, the patient claimed that she felt ‘disembodied’, as if a portion of her normal conscious experience were missing. This is not highly precise: it is possible, for example, either that Christina’s proprioception was missed in *some* or *all* of her conscious experiences. But whether Christina missed her proprioception all the time, or only sometimes, so long as she missed it more often than was required to control her actions, her case supports the theory that proprioception is at least peripherally present in conscious experience more often than would be expected in a ‘thin’ account of consciousness.

Other aspects of her account further support to the idea that proprioception contributes to some ordinary conscious experiences, independent of its instrumental contribution to bodily movement. In time, Christina learned to control her body by visually monitoring it, using her visual system to compensate for her missing proprioception. Thus, the instrumental effects of the

loss were mitigated. But this did not seem to rectify her sense of disembodiment. The only way she found to recover some sense of normalcy, reports Sacks, was for her to regain her sense of body:

‘There are brief, partial reprieves, when her skin is stimulated. She goes out when she can, she loves open cars, where she can feel the wind on her body and face (superficial sensation, light touch, is only slightly impaired). ‘It’s wonderful,’ she says. ‘I feel the wind on my arms and face, and then I know, faintly, I *have* arms and a face. It’s not the real thing, but it’s something—it lifts this horrible, dead veil for a while.’ (Sacks 1985, 53)

The presence of a ‘horrible, dead veil’ in (post-proprioceptive) ordinary conscious experience is a change to its overall character. Like her description of feeling ‘disembodied,’ the ‘dead veil’ seems to indicate that her proprioception is missed for more than just its utility – its loss changes the character of her conscious experience. Additionally, her sense of disembodiment, of deadness, is *not* relieved when she regains some of its utility by learning to use vision to play its role in monitoring and controlling posture and movement. Instead, according to her testimony, her main sense of relief comes about when she is made aware, by *other* modalities, of her body. A sense of her body seems then to be an ordinary component of conscious experience, and this must be at least partially dependent on proprioception. According to Ford and Smith, the testimony of Sacks’ ‘disembodied lady’ illustrates just how much proprioception contributes to ordinary conscious experience. It therefore serves as evidence for the peripheral presence of proprioception over a much wider range of ordinary conscious experience than would be predicted on a ‘thin’ theory of consciousness. (Ford and Smith 2006)

3. *An Introduction to Anosognosia*

To review what has been presented so far: the claim being considered is that conscious experience often includes or incorporates proprioception in its periphery and is thus relatively rich. The argument for this has been that when we notice and report on changes to a sensory modality, it seems reasonable to suppose that we are conscious of this modality or that it contributes to our conscious experience, at least to some degree. Proprioception is very rarely the focus of conscious experience, so reports that conscious experience changes when proprioceptive nerve signals are disrupted count as evidence not only that we are conscious of it (or that it contributes to conscious experience) but also that conscious experience includes at least this much periphery. Proprioception seems at first blush to be unconscious (as Sacks claims) because we rarely attend to it, but patients with proprioceptive nerve damage report changes to conscious experience (as with Sacks' own patient Christina) even after controlling for the instrumental role of proprioceptive nerve signals (Christina does not report changes merely during movement, and continues to describe a changed experience even after alternate modalities have been trained to compensate for her lost proprioception). Therefore, proprioception seems to contribute to conscious experience, which is thus at least that rich.

Advocates for a thinner theory of consciousness, however, can raise at least one objection to this line of argument, drawing on empirical evidence to do so. Patients suffering from paralysis in the wake of neurological damage sometimes fail to report on or actively deny their impairment, a condition known as anosognosia for hemiplegia or hemiparesis.

In 1991, Levine et al hypothesized that anosognosia for hemiplegia might stem from a lack of proprioceptive feedback. According to this hypothesis, in affected patients, commands to the muscles are dispatched as usual, but rather than receiving the expected proprioceptive feedback, the brain gets no response at all. In the absence of positive evidence to the contrary, patients

assume that everything is functioning normally. According to this theory, the disorder arises when sensory impairment limits patients' normal ability to monitor their own movements, and instead have to discover their impairments by observation and inference. He termed this hypothesis the 'discovery theory.' (Levine et al 1991) The discovery theory seems most straightforwardly consistent with a thin account of consciousness, because it says that patients do not notice or report on lost proprioceptive inputs and in fact assume that everything is normal. If conscious experience does not normally include proprioception, then from the patient's perspective, conscious experience *is* normal, so long as mobility of the affected limb is not involved.

If proprioception normally contributes to conscious experience such that major changes (including loss of proprioceptive nerve signals) change the character of experience, then we should expect other major changes, such as paralysis (especially when attended by nerve damage or other loss of information streams) to result in changes to conscious experience. Anosognosic patients' conclusion that their bodily functions are normal, though they are in fact paralyzed, seems like a potential counter-example to the claim that consciousness involves proprioception under ordinary circumstances such that we notice and report on (at least major) changes to proprioception. These patients experience a presumably major change, and yet do not seem to notice it. This medical condition then appears, at least superficially, to demonstrate that one *can* be blind to even major changes in proprioception (though I will argue that in the end this is not the best conclusion to draw).

The problem can be put as follows. Where movement is affected or restricted, as for example by stroke, two different predictions regarding the effects of a change in proprioception might be borne out, one consistent with a richer account of consciousness, one consistent with a thinner

account. First, suppose that the patient's proprioceptive inputs for the affected limb are lost or greatly reduced (as in nerve damage), or at least changed (as when a limb becomes paralyzed). If a rich theory of consciousness is correct in holding that proprioception is an ordinary peripheral part of conscious experience, then the patient's ordinary conscious experience should change: the patient should miss this ordinary component of experience. Even supposing input is not lost, that is, where proprioception for the affected limb remains intact, then we should expect that the very lack of movement of the paralyzed or weak limb should, on a fairly rich account of consciousness, be apparent to the patient. But a thin account of conscious experience predicts that conscious experience does not include or is not much influenced by proprioception, and so patients undergoing changes in mobility or proprioceptive input should not, on this account, notice anything amiss. Anosognosic patients, who may otherwise be quite lucid and verbally capable (as shown in Marcel et al 2004), seem to overlook their own paralysis or weakness, as a thin account predicts and a rich account does not. The thin rather than the rich prediction is thus apparently supported by this evidence.

At first, then, anosognosia for hemiplegia seems to be a textbook case of change blindness, which is evidence against a rich theory of consciousness. If the absence of proprioception contributes to conscious experience, then we should expect drastic changes to proprioception to result in changes to conscious experience. If patients can miss their own paralysis, then perhaps the proprioceptive inputs that accompany (or, in the case of somatosensory damage, *fail* to accompany) a paralyzed limb do not break the threshold of consciousness. Though this is not the only explanation for the data, all things being equal, it seems to be strong evidence in favor of a thin view over a rich view of consciousness.

Before proceeding to examine the plausibility of this counter-example, a few introductory

notes on the nature of the disorder. Anosognosia for hemiplegia should not be mistaken for simple denial in the face of unpleasant facts, an all-too-human response to being confronted with one's own frailty or mortality. First, as many have documented (see Vallar and Ronchi 2006, Pia et al 2004, Marcel et al 2004, Ramachandran 1995), anosognosia is disproportionately common among patients with damage to the right rather than left hemisphere of the brain, and hence disproportionately prevalent among patients suffering paralysis of the left (contralesional) side. Several researchers have pointed out that if the only motivating factor for anosognosia were psychological, one would not expect sidedness to be a predictive factor (although damage to language centers might explain some of this discrepancy). More importantly, there is some evidence that patients suffering from anosognosia differ behaviorally from patients in denial (see Pritigano and Klonoff 1998, Pritigano 2005). Pritigano, for example, reports that anosognosic patients act surprised or puzzled, but not distressed, or even concerned, when confronted with evidence of their disability. Patients in denial, however, tend to respond to such evidence by becoming irritable, depressed, or otherwise emotionally perturbed. Finally, as Bisiach (1991) and Ramachandran (1995) discussed, anosognosia can be temporarily alleviated when the patient receives vestibular stimulation in the form of a syringe of cold water dispensed into the left ear canal (but not the right), hardly what one would expect if denial of paralysis were motivated purely by fear of mortality.

4. *Anosognosia and Proprioception*

The degree of thinness or thickness of consciousness being proposed might seem to make a difference to the plausibility of the discovery theory. If there is a difference between patients who are (or ought to be) positively aware that a limb fails to function normally, by way of

normally functioning proprioception, and those suffering an absence of proprioceptive feedback from the affected limb, then it could be that patients who simply lack proprioceptive inputs for the affected limb are in a different epistemic position than those who retain it, thus allowing for a more restricted version of the discovery theory to hold, one consistent with some richness of conscious experience. However, Marcel et al found that somatosensory loss is not strongly correlated with anosognosia (2004). They found that anosognosia for hemiplegia is not consistently paired with impairment of either light touch or positional sensation: some patients have normal proprioception but are anosognosic; others lack proprioception for the affected limb but are conscious of their impairment.

This is inconsistent with the discovery thesis as originally formulated, as a hypothesis that somatosensory loss contributes to anosognosia for hemiplegia. If anosognosic patients can believe that things are (relatively) normal, can get by without noticing that there is anything strange about the character of their ordinary experiences, then this challenges the thesis that proprioception is normally present in the periphery of conscious experience. But for the discovery theory to be consistent with Marcel et al's findings, we would have to conclude that neither missing proprioceptive inputs nor a proprioceptive information stream from a non-mobile limb is consciously registered by the patient. This is a stronger claim than that originally made by Levine, and consequently one that is harder to defend. Though this is not on its own a fatal objection to the theory (and its implications for the debate over the relative richness of conscious experience), it does raise the stakes: if the discovery theory is borne out, it will have significant and wide-ranging implications for just how thin consciousness must be with respect to proprioception.

5. *Anosognosia, Confabulation and Estrangement from One's Body*

Levine's discovery theory presupposes a fairly 'thin' theory of consciousness with respect to proprioception. The absence of proprioception is not supposed to be noteworthy to the patient. One of the things we learn from the above evidence, though, is that if one is to keep a thin theory of consciousness consistent with the data, one must assume that proprioceptive input from a paralyzed limb can also go unnoticed, because some anosognosic patients retain proprioception, making it difficult to reconcile these cases with data like Christina's reports of disembodiment upon loss of proprioception.

This, however, is not the strongest challenge to anosognosia for hemiplegia as a possible counter-example to conscious experience's being rich enough to include proprioception in the periphery. Anosognosia is sometimes accompanied by a number of even stranger disorders, many of which suggest that something more complicated than merely overlooking impairment is at issue.

Anosognosia often persists even when evidence is available via other sensory modalities. Ramachandran (1995, 1996, 2000) and Berti et al (1998) reported that patients frequently deny impairment even when presented with *visual* evidence that they paralyzed. Some will even temporarily admit paralysis when it is demonstrated, but within ten minutes will return to denying their deficit (Ramachandran 1995, 23). None of this is explained by the discovery theory.

Confabulation, in which the patient makes up falsehoods and appears to believe them, frequently occurs in anosognosic patients. For example, a patient of the neurologist V. S. Ramachandran insisted that she had just used both hands (including one that was completely paralyzed) to wash her face (Ramachandran 1996, 352). Somatoparaphrenia is a condition in

which a patient denies ownership of a limb, as in the case documented by Bisiach and Geminiani where a woman believed her left hand actually belonged to a previous patient, who had (she thought) left it behind in the ambulance, although they report she could not explain how the stranger's hand ended up wearing her rings and jewelry (Bisiach and Geminiani 1991, 32-33). Finally, misoplegia is a hatred for one's own limb (whether or not one is also somatoparaphrenic about the same limb), as in a case documented by Oliver Sacks where a patient punched his paralyzed leg and described it as a 'creepy, horrible thing' (Sacks 1985, 56). The pairing of anosognosia with these sorts of disorders rules out the simple explanation that patients have not yet noticed their impairments.

Somatoparaphrenia can occur without anosognosia (see Vallar and Ronchi, 2006). But when somatoparaphrenia does occur in conjunction with anosognosia, the upshot is that the associated denial of impairment cannot be due to the patient's not noticing the paralysis. Vallar and Ronchi even note that in cases of somatoparaphrenia (not necessarily those that co-occur with anosognosia), patients may retain some sensation in the affected limb, but fail to integrate the information normally. One patient appeared to have a somatosensory deficit in her left hand, which she claimed was actually her niece's hand, but when the examiner 'warned the patient that she was delivering touches to 'her niece's hand'' the patient accurately reported sensations (Vallar and Ronchi 2006, 249). This is, again, inconsistent with the idea that the patient is not conscious of a change to or loss of proprioception, due to the thin nature of conscious experience.

Evidence against Levine's discovery theory thus undermines anosognosia as a counter-example to Ford and Smith's claim that proprioception contributes to the periphery of conscious experience. Conditions such as somatoparaphrenia and misoplegia are in tension with the thesis

that the paralyzed limb is not present to consciousness, since they require the patient to actively perceive and reject the affected limb. The fact that these conditions can appear in conjunction with anosognosia is evidence that paralysis is not simply overlooked.

6. *Anosognosia and Disassociated Knowledge of Impairment*

There is another body of evidence that both makes the discovery theory implausible, and raises questions about anosognosic patients' epistemic circumstances. Specifically, there is evidence that many patients have what Anton (1899) called 'dim knowledge' of their condition.

A note about terminology: Although many researchers (Ramachandran 1995, Berti et al 1998) speak of 'tacit' or 'implicit' knowledge of their condition, Bisiach and Geminiani (1991) caution against jumping to conclusions via one's choice of term: some patients will verbally admit paralysis but attempt to walk, or knit, or pursue other bimanual or bipedal tasks, while other patients will deny verbally that they are paralyzed but will be perfectly content to remain in bed, use their unaffected hand exclusively, and otherwise behave as though they are in fact aware of their condition. To call one 'tacit' and the other 'overt' would arbitrarily declare one of these cases indicative of 'tacit' knowledge and the other 'overt.' Instead, they suggest that it may be best to speak of '*disassociation of knowledge.*' (1991, 19) I will follow their lead here.

Disassociated knowledge of hemiplegia is an extensively documented phenomenon. Patients suffering from anosognosia sometimes behave or speak in ways that seem to indicate that they are in some way cognizant of their disability. This dissociated knowledge might turn out to be tacit or largely unconscious, in which case it would turn out to be at least potentially consistent with a thin account of consciousness. But many of the cases seem *prima facie* compatible with theories that hold that this knowledge can be traced back to conscious

experience. For example, confabulation, the outright fabrication of stories, makes sense as a patient's attempt to reconcile information about paralysis with beliefs about their capabilities, and more so than does explaining it as the result of patients' overlooking their own paralysis, consistent with a 'thin' account of conscious experience.

An attempt to reconcile or explain behavior, even by means of falsehoods, presumably requires the patient to be aware of the phenomenon to be explained, an obstacle to anosognosia's success as a counter-example to a rich theory of consciousness. As discussed, somatoparaphrenia (belief that one's limb is not one's own) and misoplegia (hatred of a limb) are only possible in combination with anosognosia if the patient actively acknowledges the presence of the limb in question. Presumably, noticing one's paralyzed limb would make it difficult to miss the fact that it is paralyzed, which calls into question Levine's discovery thesis, initially put forth for our purposes as evidence that conscious experience is thin enough to overlook loss of proprioception. Sacks, for example, relays an account of a patient who kept falling out of bed at night. 'When I asked him what happened at night,' reported the neurologist, '...he said quite openly that when he woke in the night he always found that there was a dead, cold, hairy leg in bed with him which he could not understand but could not tolerate and he, therefore, with his good arm and leg pushed it out of bed and naturally, of course, the rest of him followed' (1985, 57-8). This is hardly consistent with Levine's discovery theory, in which the patient simply fails to notice that his limb has become paralyzed via missing proprioception. In this case, the patient not only noticed the paralyzed limb and its abnormal condition, but took steps to remedy the situation.

One might, of course, be tempted to dismiss any evidence at all from anosognosic patients on the grounds that they are, after all, suffering from brain damage (and hence potentially from cognitive deficits) and so do not have 'normal' conscious experience upon

which to report. But as Bisiach and Geminiani (1991) discussed and Marcel et al (2004) showed, global cognitive impairment or confusion does not correlate strongly with anosognosia, and some anosognosic patients appear otherwise quite lucid, rational, and articulate. Ramachandran (1995, 1996, 2000) discusses several cases where patients' memories for other details were quite accurate, down to the tie the examiner wore during previous interviews. In one case, the examiner placed a red hair band around the wrist of a patient's paralyzed limb, then proceeded to test the patient for mobility, eventually causing the patient to conclude that she was in fact paralyzed. A few minutes later, though she still remembered the hair band, she returned to denying her paralysis and claimed to have no memory of admitting otherwise (Ramachandran 1996, 353). Bisiach and Geminiani report that patients may acknowledge one deficit (blindness, speech impediment) but not another; some even admit to paralysis of one limb but not another (1991). It seems many anosognosic patients appear to have otherwise normal conscious experiences, even though their attitudes with respect to their afflicted limbs are odd. These bizarre attitudes are not sufficiently explained simply by lack of information or experience.

Evidence for disassociated knowledge of paralysis can manifest in a variety of ways. Berti et al (1998), for instance, describe a series of interviews with a patient, CC, that seems to implicate disassociated knowledge. The following is one example. ('E' is the examiner, 'P' the patient.)

E: Could you clap your hands?

P: *I am not at the theatre.*

E: I know. But we just want to see whether you are able to clap your hands.

P: (CC lifts her right arm and puts it in the position for clapping, perfectly aligned with the trunk midline, moving it as if it was clapped against the left hand! She seems

perfectly satisfied with the performance)

E: Are you sure that you are clapping your hands? We did not hear any sound.

P: I never make noise.

E: If I tell you that your left hand is not moving, would you believe me?

P: It may be, *because it is not obeying*.

E: Why?

P: Because *there are some things that are obedient and some that are not*.

E: But the left hand is commanded by you, isn't it?

P: *I am not a good teacher. My will does not go so far*.

E: Do you think that your left hand can move?

P: Yes!

(Berti et al, 1998, pp 29-30, italics in original)

From her initial reluctance to perform a bimanual task ('I am not at the theatre') to her explanation that her hand is 'not obeying' because her 'will does not go so far,' CC appears to realize that her hand is not functional, even before she attempts movement. Yet she still insists her hand can move.

Some of Ramachandran's anosognosic patients all but admit their condition: they say things like 'I have never been very ambidextrous,' 'It isn't very fast today, is it?' and 'I am unable to *facilitate* my arm.' (Ramachandran 1995, 34) Despite these claims, however, they each deny that they are in fact paralyzed. Venneri and Shanks (2004) describe a woman who denied paralysis but note that her 'avoidance of certain actions with a rationalization and her attempts to perform certain actions with her right hand rather than left hand, however, raise the possibility that [the patient] might have had some implicit awareness of her inability although she resisted

full explicit acknowledgment.’ (Venneri and Shanks 2004, 234) To avoid attempts to move her limb, she claimed that her doctor had told her to rest the affected limb, and when pressed, said she was reluctant to make work for the staff, who would have to help her if she tried to walk on her own. Bisiach and Geminiani (1991) also reported that many patients who verbally denied plegia were nonetheless suspiciously content to remain bed-bound. House and Hodges (1988) described a woman who denied plegia but, when presented with photographs of patients with varying degrees of mobility, selected the wheelchair-bound patient as most like herself. Each of these cases suggests that information about the impairment is available to some but not all of the patient’s reasoning processes.

Some of the most interesting evidence for disassociation of knowledge of plegia comes from Marcel et al’s 2004 study of anosognosia for hemiplegia. Two findings in particular stand out. First, the researchers found that, upon interviewing patients suffering plegia due to right-brain stroke, some verbally admitted to their deficit, but, when asked to estimate their current ability to perform a number of bimanual tasks (clapping hands, tying a knot, or rowing a boat) as compared to their usual ability to do so, these supposedly ‘aware’ patients often significantly overestimated their abilities, post-stroke. This, they argued, showed that even in non-conventionally-anosognosic patients, awareness of plegia may be dissociated from estimation of abilities. Even more strangely, though, they found that many patients who were both anosognosic and who overestimated their own abilities, gave different answers when asked to rate the abilities of another person in their current medical predicament. When asked ‘If I were in your present state, how well would I be able to ..., compared with my usual ability?’ anosognosic patients were more likely to give an accurate assessment of abilities. The disparity in assessing relative strengths does not appear to merely be the result of confusion on the part of

the patient, because no patients overestimated the researchers' abilities while correctly assessing their own, as one would expect if discrepancies in self- versus third-person evaluations were rooted in confusion. Furthermore, when asked to describe how they would perform bimanual tasks in their present state, many anosognosic patients gave responses that the researchers classified as 'bizarre': The researchers note that '[s]everal stated the strength or dexterity of the unaffected limb(s); others included 'I tell the arm and leg firmly', 'I use a machine', 'I am a good sportsman'.' One said 'I use my good arm and leg,' despite denying plegia when specifically asked about strength of limbs.' (2004, 27-8) The phenomenon was so robust that the researchers had to add a special 'bizarre' category to document this phenomenon, in addition to the anticipated categories of 'no explanation,' 'reasonable' (cognizant of disability and description of a more or less workable solution), and 'unaware' (patients who apparently believe they can operate as usual). (Marcel et al 2004)

V.S. Ramachandran's experiment with his patient BM provides a different kind of evidence for disassociated knowledge of plegia. Ramachandran irrigated her left ear canal with cold water in order to trigger a vestibular system reflex. As earlier researchers had found, vestibular stimulation caused the patient to acknowledge her current paralysis. But when he asked her, 'Mrs. M., how long has your arm been paralyzed? Did it start now or earlier?' she replied, 'It has been paralyzed continuously for several days now.' A few hours later, the effect apparently wore off. While she recalled the cold water, she returned to denying both present and past paralysis. She further offered the confabulation that 'I said my arms were okay' when asked if she remembered her responses to questions about arm strength during the previous interview. (Ramachandran 1995, 35) This experiment suggests that the patient had sustained disassociated knowledge of her condition, somehow retrieved via caloric stimulation.

There is little consistency in how patients display dissociated knowledge of their deficits. While Marcel et al found that many patients could predict deficits in bimanual performance of others likewise impaired, and House and Hodges' (1988) patient identified herself as most like a wheelchair-bound patient, Ramachandran found that some of his patients denied plegia in *others*: two out of three he interviewed 'showed no awareness of the hemiplegia of the patient in the adjacent bed even when the hemiplegia was demonstrated to them.' His third patient, however, who commented about another patient, 'of course he is paralyzed... he is not moving his arm' refused to admit to her own paralysis even when she observed her own failed attempt to move her arm in front of a mirror, thus ruling out any question of visual issues affecting her assessment. (Ramachandran 1996, 355) The variety of presentations of this condition supports the robustness of the phenomenon of disassociated knowledge, one that occurs across a range of scenarios. Across variations in brain damage, time since stroke, interview conditions, and personalities, many anosognosic hemiplegic patients demonstrate disassociated knowledge of their condition. And the important thing about disassociated knowledge, as far as it relates to rich versus thin theories of consciousness, is that disassociated knowledge is *knowledge*: these patients do note their disability, even if they are unable to fully integrate this information.

7. *How is Disassociated Knowledge Acquired?*

Evidence of unintegrated or disassociated knowledge is evidence of knowledge. Whatever causes anosognosia cannot just be ignorance, because the patients are not blind to these changes in their condition. This fairly conclusively disconfirms Levine's hypothesis that anosognosic patients fail to notice their plegia. Something else must be involved, and a full account is not currently available. If these patients do not fail to notice their plegia, then

anosognosia does not serve as a counter-example to Ford and Smith's contention that proprioception is an ordinary peripheral component of conscious experience.' So the original reasons for suspecting that proprioception is peripherally present in conscious experiences, discussed earlier in this essay, still stand.

Less certain than anosognosia's failure to qualify as a counter-example to a rich conception of consciousness, but still worthy of consideration, is the suggestion that anosognosic patients gain their disassociated knowledge at least partly from changes they experience in proprioception. Evidence in support of this idea comes from the fact that many anosognosic patients actually seem to anticipate their disabilities: think of patient CC's rebuke that 'I am not at the theatre' when asked to clap, or Bisiach's observation that many patients suffering from anosognosia for hemiplegia never attempt to get out of bed or perform bimanual tasks. If these patients are aware of their deficits via changes in proprioceptive input, of which they are peripherally conscious, then this is not surprising; if proprioception is unconscious, on the other hand, then their acquisition of this knowledge requires a different explanation which must itself have some independent motivation or else be merely ad hoc. Uncovering the factors involved in dissociated knowledge of anosognosia for plegia may thus shed light on the debate over the richness of conscious experience.

Dim or dissociated knowledge of paralysis might of course turn out to be either conscious or unconscious, and none of the cases I have presented directly supports the conclusion that it is one rather than the other. However, given that data on anosognosia fails to support the claim that proprioception is ordinarily *unconscious*, and given that cases like Christina's support the idea that proprioception plays a constitutive role in conscious experience, this suggests a natural explanation for dissociated knowledge displayed by these patients: they are in possession of

knowledge about this disability in virtue of changes to the character of conscious experience, though unable to articulate or fully integrate this information.

This is consistent with some patients' displaying dim knowledge preemptively, in particular: those occasions where patients volunteer to remain bed-bound or offer excuses for not performing bimanual tasks or work with the affected side, even before trying and failing. Though there may be alternative explanations available, the fact that they do so is unsurprising given the thesis that proprioception is ordinarily present in the periphery of consciousness. That is, all on its own, anosognosic patients' disassociated knowledge of their disabilities offers no reason to believe that proprioception is an ordinary component of conscious experience. But anosognosics' disassociated knowledge of their impairments is consistent with and partly explained by the hypothesis that proprioception is peripherally present in conscious experience, such that at least major changes are noticeable.

8. *Conclusion*

In the preceding discussion, I considered some reasons to think that proprioception makes for a particularly interesting area of inquiry in the debate over the richness of conscious experience. I went over some reasons to think that major changes to proprioception affect conscious experience, thus making a case for proprioception as a constitutive element of conscious experience, supporting the idea that conscious experience has enough of a periphery to sustain this. I considered anosognosia for hemiplegia as a possible counter-example to the claim that proprioception is ordinarily present in the periphery, and that the reasons to think anosognosia for plegia would make such a counter-example are inconsistent with the evidence on this disorder. I thus concluded that evidence for proprioception in the periphery stands unchallenged,

at least on this front. Furthermore, I found that some of the features of anosognosic patients require explanation, an explanation that may be supplied by a rich theory of consciousness which postulates that proprioception is a peripheral component of experience.

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