

Two Brains, Two Minds? Wigan's Theory of Mental Duality

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I INTRODUCTION

The occasion for writing this essay is the republication of A. L. Wigan's long-neglected classic study, *The Duality of the Mind* [1844, 1985], edited by Joseph E. Bogen and Joseph Simon. As Dr. Bogen makes clear in his Foreword to the volume, award of a Nobel Prize in physiology in 1981 to Roger Sperry for his work with split-brain patients has brought widespread attention to the duality of the brain; whether this also signals the presence of a dual *mind* in normal humans, as Wigan argued, is of course highly controversial. Bogen nevertheless states at the end of his Foreword that Wigan's 'prophetic vision was over 100 years ahead of the evidence which has ultimately sustained him (p. xv)'. In this essay I shall be concerned whether, or to what degree, Wigan's theory has indeed been confirmed by split-brain and related studies. But it will be equally important to this task to examine the conceptual framework Wigan was working in.

What exactly was Wigan's theory? Perhaps his most succinct statement of this is found in Chapter XIX of the present edition:

There are some corrolaries which only need to be named, and their truth is so easily comprehended as to produce instant assent. If, for example, as I have so often stated, and now again repeat, one brain be a perfect instrument of thought—if it be capable of all the emotions, sentiments, and faculties, which we call in the aggregate, mind—then it necessarily follows that man must have two minds with two brains; and however intimate and perfect their unison in their

natural state, they must occasionally be discrepant when influenced by disease, either direct, sympathetic, or reflex (201–2).

Two objections immediately arise from this synopsis. First, it does not follow *necessarily* that if we have two brains we have two minds, anymore than it follows necessarily from having two nostrils that we have two senses of smell.¹ Second, if it were the case that we have two minds, we should know this from experiencing two distinct trains of thought, etc., occurring to us simultaneously. Wigan apparently thought he did sometimes experience this, but most of us make no such claim. So in order for Wigan's theory (at least as stated above) to stand a chance of being true, he would have to explain how it is that we *do not experience any such mental duality*. I believe there is a way to explain this, but only by major revision of Wigan's working concepts.

2 WIGAN'S ARGUMENT FOR OUR HAVING TWO BRAINS

But I am getting ahead of myself. Let us first examine the reasoning that led Wigan to conclude that we normals have not one but two brains.² I think his argument to this effect in Chapter IV striking, even if he was obviously wrong about the brain in other respects (he thought each cerebral hemisphere has only three lobes, rather than four; and that disease could be transmitted from one hemisphere to the other only through the meningeal coverings, rather than the corpus callosum):

I believe it to be entirely unphilosophical, and tending to important errors, to speak of the cerebrum as one organ. The term *two hemispheres of the brain* is, indeed, strictly a misnomer, since the two together form very little more than one half of a sphere . . . The two hemispheres are really and in fact two distinct and entire organs, and each respectively as complete (indeed more complete), and as fully perfect in all its parts, for the purposes it is intended to perform, as are the two eyes. The corpus callosum, and the other commissures between them, can with no more justice be said to constitute the two hemispheres into one organ, than the optic commissure [optic chiasm] can be called a union of the *two eyes* into one organ; and it would be just as reasonable to talk of the two lobes or globes of the eye, as of the two hemispheres of the brain (19).

¹ This is not to deny that we have two *organs* for smelling (the two sides of the olfactory bulb, each supplying the ipsilateral cerebral hemisphere with neural input that transduces into olfactory sensations): on this point Wigan was absolutely correct.

² Wigan's *psychological* conversion to belief in double mindedness was occasioned, he says, by a discovery he made at autopsy early in his career:

One hemisphere was entirely gone—that was evident to my senses; the patient, a man about fifty years of age, had conversed rationally and even written verses, within a few days of his death; yet I knew that, according to books, the mind could only manifest itself through a complete brain (which is true enough as I now explain it [he means each hemisphere is a complete brain]), and I was in a similar state to that of persons who cannot refuse assent to geological facts, yet cannot reconcile them to the writings of Moses, in which they have absolute faith (32).

Surely Wigan is on sound ground here. We feel no impulsion to conceive of a single organ, 'the eye', having two vitreous projections beyond the skin surface of the face; why then should we talk of 'the brain' as a single organ having two fibrous intracranial bulges? At the very least we can concede to Wigan that commissural connections between the cerebral hemispheres do not of themselves make these a single organ, and thus that it is equally correct to speak of 'the brain' as two cerebra, two half brains, or even two brains.

3 EVIDENCE FOR DOUBLE MINDEDNESS IN SPLIT-BRAIN PATIENTS

But again two brains do not necessarily amount to two *minds*, and this is where the work of Sperry and others on split-brain patients becomes crucially relevant to Wigan's contention. For as a consequence of the therapeutic (for relief of *grand mal* seizures) surgery, or even of natural lesions to the corpus callosum uniting the two hemispheres, the patient displays thereafter a well-defined *disconnection syndrome*. This syndrome is not revealed in everyday behaviour (indeed such patients can pass a routine neurological examination if the physician is not looking for it), but under strictly controlled laboratory testing conditions it is unmistakably present. For example, a right-handed patient easily names objects palpated out of sight in the right hand (projecting most of its sensory fibres to the left, speaking hemisphere), but he or she cannot name objects palpated out of sight in the left hand (since almost all the sensory fibres of that hand project to the right, mute hemisphere, and there is no commissural transfer of the information to the speech hemisphere). Yet the 'same' patient *knows* what is being palpated in the left hand, for upon command he or she can retrieve it from an array of objects behind a screen with that left hand (though not with the right hand, in the absence of interhemispheric commissural transfer). Since normal individuals like ourselves never display such bifurcated behaviour, there is no doubt we are dealing here with two independent streams of consciousness, or minds.

However, the best demonstration of a disconnection syndrome is accomplished in the visual modality, using a tachistoscope. This device back-projects on a screen in front of the patient a picture or a word for one-tenth of a second or less (long enough to register consciously in either hemisphere, but too quickly for normal scanning movements of the eyes to get the information from both sides of the screen into each hemisphere). If for example the patient is asked to fixate on a spot in the centre of the screen and the word TAXABLE is flashed so that the letters TAX fall to the left, and the letters ABLE to the right, of fixation, the right-handed patient with a disconnection syndrome will *say* he or she saw the word ABLE. Yet if asked to point to the word seen using the *left* hand, he or she will select the word TAX from a list of words that includes both ABLE and TAXABLE. The normal subject like you or I would, of course, say the word was TAXABLE and would point to TAXABLE with *either* hand.

What explains this difference in behaviour? Given the concavity of the eyeballs, light from the right half visual field falls on left (temporal) hemiretina of the left eye, and on the left (nasal) hemiretina of the right eye. Neural impulses from these hemiretinae then join at the optic chiasm to project back to Brodmann's area 17 (primary visual cortex) in the occipital lobe of the left, speaking hemisphere. This is why the patient with a disconnection syndrome verbally reports seeing the word ABLE.

Similarly, light from the left half of the visual field strikes the right (nasal) hemiretina of the left eye, and the right (temporal) hemiretina of the right eye. Impulses from these hemiretinae then join at the optic chiasm to project back to the homologous area 17 in the occipital lobe of the right, mute hemisphere. This is why the patient with a disconnection syndrome, using the left hand under control of the nonspeaking right hemisphere, points to the word TAX and not to ABLE or to TAXABLE.

In a normal subject like you or I, however, there is a transfer of what was seen in area 17 of the right hemisphere via the corpus callosum (actually using fibres in its posterior 2/3, called the splenium) to the adjoining area 18 (prestriate cortex) of the left hemisphere. In this way do the letters TAX join the letters ABLE to register there as the whole original word, TAXABLE. But if this is what goes on in the left hemisphere of the normal subject, what is going on in his or her *right* hemisphere? As we have already seen, in the split condition this right hemisphere is capable of pointing with the left hand to the letters TAX as what it has perceived on the left side of the screen. If so, there is no good reason to doubt that in the unsplit condition area 17 of the left hemisphere projects the letters ABLE across the splenium to area 18, prestriate cortex, of the mute right hemisphere, thus forming the original complete word TAXABLE in that hemisphere as well. This, then, provides the model of mental duality Wigan was looking for a century and a half before.

4 WIGAN'S MIS-STATEMENT OF HIS THEORY

Yet Wigan did not find it. Why not? One reason may be that he was confused about what, exactly, he was claiming. What he *believed* he was claiming is set out with great clarity in Chapter IV, in the form of four propositions:

1. That each cerebrum is a distinct and perfect whole, as an organ of thought.
2. That a separate and distinct process of thinking or ratiocination may be carried on in each cerebrum simultaneously.
3. That each cerebrum is capable of a distinct and separate volition, and that these are very often opposing volitions.
4. That, in the healthy brain, one of the cerebra is almost always superior in power to the other, and capable of exercising control over the volitions of

its fellow, and of preventing them from passing into acts, or from being manifested to others (20).

Yet in Chapter XIX we find Wigan saying this:

I think it may be assumed without risk of contradiction, that the fact of each brain being a perfect and complete instrument of thought is abundantly proved. That each, while in health, corresponds entirely with its fellow, is obvious from the fact that this unison and correspondence give only one result, as in the case of the two eyes producing single vision (204).

Even on the face of it, this statement about the two eyes giving only one result, *i.e.* one visual percept, contradicts Wigan's own proposition 2 above, since if visual perception is a mental activity then on his theory it should occur 'separately' and 'distinctly' in each cerebrum simultaneously. And if it did, that is if our consciousness spanned both cerebra, then we should perceive any object of perception *twice* side-by-side: *i.e.* we should have *double vision*. It is not having two *eyes* that creates a problem for Wigan's theory (even with one eye closed, the residual eye has two hemiretinae projecting fibres to area 17 of both left and right hemispheres); nor does it matter that there should be perfect 'unison and correspondence' between the two percepts: two is not one and that is what mental duality requires. The real problem is that Wigan couched his theory in terms of *one person having two minds*, which if understood literally entails our having, *e.g.*, double vision, though in fact we experience nothing of the kind.

5 RESTATEMENT OF WIGAN'S THEORY

Can the theory be saved nonetheless? I believe it can. Suppose we make a distinction Wigan did not make, between the human being qua *individual organism*, and the human being qua *person*. *i.e.* complex minded entity. We are then in a position to restate the theory of mental duality as follows: the individual human organism, having two brains, is the biological substrate of *two persons*, each of which has one mind. In that case, there will be, *e.g.*, double vision at the level of the *organism*, but each of the two *persons* will experience only single vision because, while each cerebrum receives input from the contralateral hemisphere about ipsilateral body space, neither cerebrum has introspective access to the conscious contents of the other.

Why not? An answer may be devined from evolutionary considerations. All vertebrate species have evolved two neural ganglia, one to each side of the anterior portion of a single neuraxis. Given this pattern of development, it comes as no surprise that all such species also evolved commissural connections between the two ganglia, since otherwise (given decussation of sensory and motor nerve tracts, with the exception of olfactory fibres) each ganglion would be ignorant of what is going on in ipsilateral body space. But it

would be equally important for such species that consciousness *not* span the two cerebra, *i.e.* that there not be unity of consciousness within the whole cranium, to avoid subjective double mindedness: imagine the effect, for example, on our arboreal primate ancestors of seeing two branches out there side-by-side, when in reality there is only one! This means that in more highly evolved vertebrate species like our own, the function of the corpus callosum is not to integrate, but rather to duplicate the contents of conscious experience for the mutual benefit of the two cerebra.

6 CURRENT MISCONCEPTIONS OF DOUBLE MINDEDNESS

It is failure to make this distinction between dual mentality at the level of the organism, on the one hand, and subjectively experienced double mindedness on the other, which motivates much of the criticism directed at the theory. In her recent book, for example, Patricia Churchland describes the theory as a claim that 'everyone has two minds (180)'. Now what is meant by 'everyone' here? If she means every normal human *organism*, that is correct. If, however, she means every complexly minded entity, or *person*, that is not what the present restated version of Wigan's theory maintains. She then comments that the theory entails 'believing that each skull houses two persons/minds and that one is not, so to speak, *oneself* (*Ibid.*)'. But why should not each person of the pair, with but one mind, be 'oneself' to him/herself? Each would have a single stream of consciousness, even though its conscious content concerning ipsilateral body space is being relayed to it from the contralateral cerebral companion. The fact is that nothing one experiences in such a state would be any different from what one experiences at present; it is only when confronted with a disconnection syndrome that the original duality is revealed.³

7 THE EVIDENCE FOR DISGUISED TRANSCALLOSAL INHIBITION

If this were all that could be said for the theory, it would appear to be largely a verbal issue about how best to describe the organization of consciousness in the human brain. But in fact there is more to recommend it: namely what is hinted at in Wigan's proposition 3 (that each cerebrum is capable of distinct and often opposing volitions), and in his proposition 4 (that in the healthy brain dominance of one cerebrum over the other prevents this conflict being manifested in behaviour). For hemispheric disconnection, whether by therapeutic surgery or natural lesion, not only blocks information transfer between the two cerebra; it also disrupts *transcallosal inhibition*, thereby freeing the nondominant (usually the right) hemisphere to undertake independent

³ Although it may well be the case that duality is known to the mute right hemisphere of every normal human being, simply because it knows it is not generating the linguistic behaviour it observes emanating from its own body.

actions involving the contralateral (usually the left) body side, actions that surprise and perplex the dominant or speaking hemisphere.

Following are some examples of resulting intermanual conflicts and the 'alien hand' phenomenon, drawn from Bogen's [1985] authoritative review of the disconnection syndrome:

The most interesting finding in the entire examination [of a patient presenting with a disconnection syndrome] is the frequent occurrence of well-coordinated movements of the left arm which are at cross purposes with whatever else is going on. These sometimes seem to occur spontaneously, but on other occasions are clearly in conflict with the behavior of the right arm. For example, when attempting a Jendrassic reinforcement, the patient reached with his right hand to hold his left, but the left hand actually pushed his right hand away. While testing finger-to-nose test (with the patient sitting), his left hand suddenly started slapping his chest like Tarzan (312-13).

While doing the block test unimanually with his right hand [another patient's] left hand came up from beneath the table and was reaching for the blocks when he slapped it with his right hand and said, "That will keep it quiet for a while (313)".

The patient may say, when the left hand makes some choice among objects, "My hand did that", rather than taking the responsibility. A patient was described [by an earlier investigator] as saying, "Now you want me to put my left index finger on my nose". She then put that finger into her mouth and said, "That's funny; why won't it go up to my nose (313-14)?"

Bogen's own summary of the disconnection syndrome, after decades of clinical experience, is the following:

Split-brain patients soon accept the idea that they have capacities of which they are not conscious, such as retrieval [with the left hand] of objects not nameable. They may quickly rationalize such acts, sometimes in a transparently erroneous way. But even many years after operation, the patients will occasionally be quite surprised when some well-coordinated or obviously well-informed act has just been carried out by the left hand (314).

Of course when Bogen speaks here of 'the patient' having capacities of which he is not conscious, he means the person based in the speaking hemisphere; we have no good reason to doubt that the person based in the mute, right hemisphere and controlling the left hand retrieves objects *consciously*. Similarly, it is the dominant left hemisphere-based person who is surprised when the left hand carries out a well-informed or well-coordinated act; the right or nondominant hemisphere-based person is not surprised, since he or she initiated that act.

8 CONCLUSION

Those sceptics about mental duality who give the safe rejoinder that it is ablation of the forebrain commissures which creates double mindedness in patients manifesting the disconnection syndrome, so that its symptoms tell us nothing about the organization of consciousness in normals, must ask themselves how it is possible one half of a formerly healthy (except for proneness to epileptic seizures in many cases) brain—the half that does not even think in language—should be able to perform transparently intentional and purposeful acts like repeatedly throwing a newspaper to the floor during television commercials (the right hemisphere cannot read, and the newspaper does block its view of the TV screen); or slapping one's face when it is time to get up and have breakfast.⁴ Such acts require, at the very least, memory, foresight, and anticipation of probable responses from the dominant, speaking hemisphere. Did these characteristically human psychological capacities arise *de novo* from the disconnection, or were they not previously present but suppressed by the unconscious inhibitory influence of the speech hemisphere, acting through the intact corpus callosum? The latter seem a far more parsimonious explanation of the behaviour Bogen has described.

I conclude that just as one mind does not become two upon hemispheric disconnection, so two minds do not become one upon maturation and myelination of the commissural fibres linking together the two brains in our heads. Wigan may have not proved his theory, but he was on the right track.

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⁴ The latter two examples were originally supplied to me by the late Stuart Dimond (personal communication, [1978]).

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