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Split Brains

Brain bisection raises the intriguing question about how many minds the split-brain patients have. Thomas Nagel and Derek Parfit, who have brought this question into consideration, come to similar conclusions in response to it.¹ They both argue that the question has no answer, that there simply isn't any countable number of minds that the split-brain patients have. In addition, Parfit argues that the split-brain cases can be adequately described only if we adopt a certain particular view about the metaphysical nature of a person. In what follows I will describe and clarify both of those views. In particular, I will explain why Parfit's preferred model of personhood does not determine how many persons survive brain bisection. As I will argue, the crucial reason for this is that Parfit's model does not fully explain the unity of consciousness in the split brain cases; the explanation it offers is only partial in the sense to be explained later. This does not seem to be a problem that affects only Parfit's preferred model. There is a reason to think that no theoretical account of personhood could do the required explanatory job.

Let me begin with a brief description of what the brain bisection consists in. The bisection consists in disconnecting the two halves of the cerebral cortex. Normally the two hemispheres communicate with each other directly by a band of nerve fibers called *corpus callosum*. This direct communication plays an essential role in integrating the functions of the two hemispheres in ordinary people. Once the hemispheres have been disconnected, they start processing inputs from the external world independently of each other. The inputs that come to the left hemisphere are not further transmitted to the right hemisphere and the inputs processed by the right hemi-

¹ See Th. Nagel, *Brain Bisection and the Unity of Consciousness*, "Synthese", 1971 (22); D. Parfit, *Divided Minds and the Nature of Persons*, [w:] *Mindwaves*, eds. C. Blackmore and S. Greenfield, Oxford 1987, Oxford: Blackwell.

sphere are not transmitted to the left one. This leads to some very interesting results given that by and large, each hemisphere processes inputs from only one side of the body. In particular, each hemisphere controls only one of our arms and each hemisphere receives inputs from only one half of our visual field. In both of these cases, the input goes to the opposite hemisphere. So for example, tactual stimuli from the left hand are transmitted to the right hemisphere and visual impulses from the right half of our visual field are transmitted to the left hemisphere. Another interesting aspect of this division of functions between the two hemispheres is that only the left hemisphere controls the production of speech.

The interesting result that the brain bisection brings out is that if we artificially segregate the inputs to the two hemispheres, the inputs will create two independent sensations or will lead to two independent actions. For example, if two different words are flashed to the two parts of the visual field and the split-brain patient is told to pick up the corresponding object from beneath a screen, his two hands will search for the objects independently, without any interaction. Similarly, if two shapes are flashed to the two halves of the visual field or if they are held out of sight in two hands, the split-brain patient won't be able to tell (or simply indicate by shaking his head) whether the shapes are the same or different. Nor will he be able to tell whether two spots in opposite half-fields are the same or different in color.

This functional disintegration, however, disappears when no segregation of input to the two hemispheres has been artificially created. Thus both hemispheres fall asleep and wake up at the same time, and the split-brain patients perform well in many activities requiring bilateral coordination, such as playing the piano, buttoning shirts, swimming. Moreover, they do not normally report any sensation of division or reduction of the visual field.

According to Nagel, there are five possible interpretations of those experimental data in response to the question about how many minds the split-brain patients have:

- (1) The patients have one fairly normal mind associated with the left hemisphere, and the responses emanating from the nonverbal right hemisphere are the responses of an automaton, and are not produced by conscious mental processes.
- (2) The patients have only one mind, associated with the left hemisphere, but there also occur (associated with the right hemisphere) isolated conscious mental phenomena, not integrated into a mind at all, though they can perhaps be ascribed to the organism.
- (3) The patients have two minds, one which can talk and one which can't.
- (4) They have one mind whose content is split into two conscious streams.
- (5) They have one mind that splits in two and reconvenes after the experiment is over.

Out of those five options, the first two are, according to Nagel, the least plausible. The activities of the right hemisphere are too elaborate, too intentionally directed and too psychologically intelligible to be regarded merely as a collection of unconscious automatic responses. The high degree of organization and intermodal coherence of the right hemisphere's activities make it also clear that they belong to a mind. So this leaves us with the three other interpretations of how many minds the split-brain patients have: they may have two minds, or one mind, or it may be the case that their single mind splits in two only when the inputs to the two hemispheres are segregated.

What supports the view that they have two minds, according to Nagel, is that each side of the brain produces its *own* perceptions, beliefs, and actions.² When provided with two segregated visual inputs, for example, the split-brain patient undergoes simultaneously two visual sensations, such that in having each of them he is *unaware* of having the other. On the other hand, the highly *integrated* character of the split-brain patients' relations to the world in ordinary circumstances is the reason for thinking that they have only one mind.³ When no segregation of input to the two hemispheres has been artificially created and the two hemispheres can process similar inputs, they will provide unified information about the world. For example, if the split-brain patient is permitted to look at each of two shapes or colors with his two eyes, any inconsistency between what he can see with one eye and what he can see with the other will disappear.

The initial plausibility of both the third and the fourth interpretations may suggest that the correct description of the experimental data about the split-brain patients must be a combination of both those views and hence that the patients have one mind that splits in two and reconvenes after the experiment is over. This is the hypothesis (5) on Nagel's list. As Nagel argues, however, that hypothesis loses its plausibility on closer reflection. This is so for two reasons. First, the hypothesis is entirely ad hoc. It is explanatorily convenient but the facts as such do not seem to support it. For there is nothing in the experimental situation as such that might be expected to produce a fundamental *internal* change in the split-brain patients. The segregation of inputs to the two hemispheres produces no anatomical changes and merely elicits an unusual set of symptoms. That does not provide enough ground for thinking that during the experiment two minds pop in and out of existence. But secondly, the hypothesis (5) does not even satisfactorily explain all the experimental data because there is no clear separation in time between the split-brain patients' integrated responses and the dissociated ones. In addition during the experiment the patient is functioning largely

² This view is endorsed by Roger Sperry who first performed the operation of cutting the connections of the corpus callosum between two hemispheres. See R. Sperry, *Hemisphere Deconnection and Unity in Conscious Awareness*, "American Psychologist", 1968 (23).

³ This view is endorsed by Charles Marks and Michael Tye. See Ch. Marks, *Commissurotomy, Consciousness, and Unity of Mind*, Cambridge, Mass. 1980, MIT Press; M. Tye, *Consciousness and Persons. Unity and Identity*, Cambridge, Mass. 2003, MIT Press.

as if he were a single individual: in his posture, in following instructions about where to focus his eyes, and in the whole range of behavioral control involved in situating himself in relation to the experimenter and the experimental apparatus. Thus if there are two minds associated with split brains during the experiment, we might equally well say that there are two minds operating essentially in parallel the rest of the time.

After rejecting the fifth hypothesis, the choice we are left with is between the hypotheses (3) and (4). Nagel claims that the experimental data provide as much support for the third hypothesis as for the fourth. If we take into account the *integrated* character of the patients' relations to the world in ordinary circumstances, we may think that they have one mind. But if we focus on the fact that they have *two independent streams of conscious experiences* and are not aware of simultaneously undergoing two sensations, say, we may be inclined to think that the sensations belong to two separate minds.

This second hypothesis is questioned by Michael Tye but not successfully, I think.⁴ Imagine, says Tye, a person who is buried in sand but whose eyes and ears are moved away from the body above the sand, while the relevant neural connections are stretched and remain intact. All of this is done when the person is unconscious. When the person awakens, he has an audiovisual experience of himself on a roller coaster (as presented to him by his eyes and ears in an IMAX theater) while simultaneously having tactual and bodily experiences of being motionless and surrounded by sand. Those two sorts of experiences are unrelated to each other and in this respect, argues Tye, the person in the imagined scenario is like a person with a split brain. However, it is clear that those experiences are experiences of a single person. This last point is, of course, right. But as Tye himself acknowledges, there is a significant difference between the imagined scenario and the case of split brains. In the former case, the relevant experiences are not entirely disconnected. The subject is aware of them at the same time and hence experiences some sort of unity. In the case of split brains, on the other hand, we do not have any unity of experiences at all. By assumption, the split hemispheres process perceptual inputs independently of each other and, in effect, the split-brain patients are not able to bring all of their experiences under a single act of awareness.⁵

I take it then that the third hypothesis from Nagel's list is not implausible or counterintuitive. The hypothesis (3) seems to be as much plausible as the hypothesis (4) and this, as I just said, is the view endorsed by Nagel. Nagel concludes that there

⁴ See M. Tye, *Consciousness...*, p. 118-19.

⁵ Tye considers also the case of people with object-centred "tunnel vision". These people cannot make any comparisons between objects. As they focus on one object, they lose cognitive awareness of the other objects and it is conceivable, argues Tye, that this cognitive deficit is mirrored at the level of the relevant experiences. But if that is right, then it is not clear why this case should be described as the case in which there is one person involved. Tye assumes that it is obvious that the case under consideration does not involve two persons. But that is not obvious at all. The case seems to be as much problematic as the case of split brains. *Ibid.*, p. 119.

is no countable number of minds that can be ascribed to the split-brain patients. These patients fall midway between ordinary persons with intact brains and pairs of individuals engaged in a performance requiring exact behavioral coordination, like using a two-handed saw, or playing a duet. In the latter case, we have two minds which communicate by sending subtle perceptible signals; in the former we clearly have a single mind. The split-brain patients resemble a pair of individuals to the extent that there are two separate streams of consciousness associated with both of their hemispheres. However, due to similarities of initial input that the split hemispheres normally process, the coordination between them is more direct than that between two individuals. On the other hand, the cooperation between the two hemispheres is not as direct as in the case of an intact brain where there is a two-way internal communication system.

As I mentioned at the beginning, Nagel's view regarding the split-brain cases corresponds to the view developed by Parfit. Similarly as Nagel, Parfit assumes that there is no one privileged metaphysical description of those cases and, in particular, that it is hard to settle whether split brains are single persons or two persons in one body. The natural view, according to Parfit, is that split-brain people have two independent streams of consciousness and this view is consistent with both of the above metaphysical descriptions. We may think that the two streams are two separate persons or that they are parts of a single person. Intuitively, both of those views are equally compelling. For this reason Parfit thinks that the metaphysical question of how many persons survive brain bisection is uninteresting and argues that instead of asking metaphysical questions about the status of the split brain cases, we should make sure that we describe those cases properly, that is, consistently with our intuitions.

In particular, Parfit argues that we should not describe those cases from the point of view of the so-called *Ego Theory*. The Ego Theory is an influential metaphysical theory of personhood but it becomes counterintuitive when we use it to describe the split brain cases. According to that theory, a person is a separately existing *ego* or *subject of experiences*, distinct from our brains and bodies, and the various kinds of mental states and events. An ego is something that unifies someone's experiences at any time. So assuming that the split-brain patient undergoes two independent streams of experiences, the Ego Theorist would explain the unity of each of those streams by saying that the experiences within each stream are being had by a single ego. But the ego that unifies experiences within one stream would be different from the ego that unifies experiences within the other stream and hence the Ego Theorist would be inclined to say that there are two egos involved in the split brain cases. So this means that the Ego Theory is committed to the view that there is only one proper description of the split brain cases, namely that they involve two persons. But that is counterintuitive. Intuitively, we can also make sense of the idea that the streams of consciousness corresponding to the split parts of the brain belong to one person.

Parfit concludes that the split brain cases falsify the Ego Theory. Of course, we could not defend the Ego Theory by saying that one and the same person can have two separate egos. An ego, by definition, is meant to be identical with a person. So we simply have no reason to believe that there are any egos that are different from persons.

Now, if the Ego Theory is not acceptable as a description of the split brain cases, it is natural to ask whether there is some other theory of personhood that would pay the bill. Parfit argues that there is such a theory. This is the so-called *Bundle Theory*. According to that theory, a person is not something over and above mental states and events that it undergoes; instead, it is simply identical with a series of such states and events. A series of different mental states and events — thoughts, sensations, and the like — is unified by various kinds of *causal relation*, for example, the relation that holds between experiences and later memories of them. Such causal unification is all there is to the unity of a person.

On the Bundle Theory, then, the split-brain cases involve a pair of mental states, namely two states of being aware of several different experiences. Each of those states is a series of causally connected experiences and that causal connection explains how the experiences within each stream are unified. This explanation does not appeal to two separately existing egos which are not the same as the single persons whom the split-brain cases involve. So the Bundle Theory, according to Parfit, makes perfect sense of the commonsense intuition that in the case of the split brains we are dealing with a single person with two streams of consciousness. As we saw, the Ego Theory was inconsistent with that intuition. Since the Ego Theory introduced two egos into the picture, it could not make sense of the idea that the split streams of consciousness belong to one person. The Bundle Theory, on the other hand, has no trouble in accounting for this intuition and for this reason this is the theory of personhood that we should prefer. At least this is the theory that we should prefer as a description of the unity of consciousness in the split brain cases.

To make things clear, I take it that Parfit adopts the following view: even though the Bundle Theory is at an *intuitive level* consistent with the view that split brains belong to single persons, the theory does not single out this view as the privileged description of the split brain cases because it is also at an intuitive level consistent with the view that the split brain cases involve two persons rather than one. You can see this once you realize that, under the Bundle Theory, a split-brain patient's two streams of consciousness are *two separate series* of causally connected experiences. The causal connections exist between experiences within each of the two streams but the streams as such are not causally linked to each other and, in this sense, the two streams are two separate series of experiences. There is causal unity within each of the two streams but there is no causal unity between the two streams as such. And if that is the case, it is not metaphysically determined that the two streams should be attributed to one and the same person. We may still think that they belong to two different persons rather than one. So the description of the split brain cases in terms of

the Bundle Theory does not provide any definite answer to the metaphysical question of how many minds survive brain bisection. The point to be emphasized though is that this, according to Parfit, is something that we should expect.

One could argue that we might still be able to come up with a theoretical conception of personhood that would be broad enough to account not only for the unity of each of the two parallel streams of consciousness but also for the unity of the two streams with each other. I think, however, that we should be skeptical about this. First, such a conception can hardly be formulated within the framework of the Bundle Theory. That is, the unity of the corresponding streams of consciousness can hardly be explained in terms of some network of causal connections between experiences. The reason for this is again that there is no causal connection at all between experiences from both streams. There is a high functional integration between them in normal circumstances but no causal connection since the two hemispheres process sensory inputs from the environment completely independently of each other.

Perhaps we could account of the unity of the split streams of consciousness in some non-causal terms. But then the trouble is that we will have two different accounts of the unity of experiences, one for the split streams as such and one for experiences within each of the two streams, and it seems quite arbitrary to suppose that facts explaining the unity of the streams as such should be different from facts that explain the unity of each of those streams taken independently. This problem does not seem to affect only the Bundle Theory. It seems that no theory can appeal to the same facts in fully explaining the unity of consciousness in the case of split brains. Given that the corresponding streams of experiences are independent of each other in the sense that they are generated by the corresponding hemispheres separately, facts explaining the unity of experiences within each stream, whatever they are, cannot explain the unity of the whole streams as such.

I take it then that theories of personhood are not much useful in the end in explaining the unity of experiences in the split brain cases. This, of course, only confirms Nagel's and Parfit's claim that the issue of how many persons survive brain bisection has to remain unsettled.*

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