Phil 296D: Phil Mind Seminar W 21 Prof. Aaron Zimmerman
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Handout #5: The Disunity of Consciousness

Phenomenological Unity at a Time: "A subject's phenomenal consciousness at any moment in time, is a single thing" (O&O, 1998, 178).

O&O interpret this thesis to imply that each of us has just one phenomenally conscious experiential state at each moment in time even if that single state has multiple contents. So one doesn't have an experience of sound at t--let it be x--and a visual experience of movement at t--let it be y-- where $x \neq y$ but a visuo-auditory experience z which has x and y as components or parts.

This seems to be the view embraced by Bayne and Chalmers.

Question: Isn't composition of this sort in the eye of the beholder? Are there really facts of the matter as to whether representations or experiences are fused or distinct? Is this a phenomenological claim? A neurophysiological claim? Something else instead?

O&O: Monophonic unified consciousness: The only way in which we could say that phenomenal consciousness is unified and non-composite would require consciousness to have a single content at each time. Polyphonic unified consciousness implies the binding together of experiences within and across modalities into a unitary state with multiple contents at a given time.

Phenomenological Unity Across Time: "As Wundt observed in the 1880s, even two simultaneous events are experienced either fused into a single experience or serially, one after the other. There is no such thing as true psychological simultaneity of two distinct event" (Baars, 1988, 83).

O&O: If phenomenally conscious experience is not unified at a time, if many things can co-occur or unfold in parallel within one's experience at a time, then consciousness is not serial.

Question: Might conscious experience be unified over time without being serial? What if there are integrated overlapping "threads" to each person's experiential "rope"?

The Disunity Thesis: "Phenomenal consciousness… is not a unity, rather it is manifold and distributed."

Questions: If typical consciousness is disunified in the manner asserted by O'Brien and Opie, does this help us explain what it is like to have undergone brain bisection? Does it help us answer Nagel's worry that the results of brain bisection undermine the coherence of our folk psychological concept of minds?

1. The Monophonic Model

Penrose and others notice that attention is limited and it is consequently difficult to add additional components to one's conscious state at a given time without losing some aspects of one's original consciousness.

O&O: (1) This may be particularly true of discursive consciousness (where one cannot think (or interpret or comprehend or silently speak) two different things to oneself at a given time) but not consciousness more generally. "Sound and vision don't compete for a place in awareness" (381). (2) Focal attention is particularly limited but it is just one element of one's overall experience at a time. (3) **The distinction between focus and periphery** already implies multiplicity within experience so the defender of monophony must equate total consciousness with attention. "It is possible simultaneously to focus on one thing and be aware of other things" (383).

Importance of periphery/focus distinction for addressing Huxley's argument for epiphenomenalism: O&O, following Bain, James and Peirce, argue that automatic activities like walking, driving or knitting (for those of us who have largely habituated these actions) are not performed unconsciously; instead our movements manifest in the periphery of consciousness and are monitored for irregularities which, when they occur, draw attention to the task. See O&O's analysis of tennis.

Recognizing an element of background phenomenology by its subtraction: Oliver Sack's polyneuritic patient who lost proprioceptive experience: "Something awful's happened. I can't feel my body. I feel weird—disembodied."

2. The Polyphonic Model

Churchland, "Consciousness harbors the contents of the several basic sensory modalities within a single unified experience. A conscious individual appears to have not several distinct consciousnesses, one for each of the external senses, but rather a single consciousness to which each of the external senses contributes a thoroughly integrated part."

Churchland's anatomical hypothesis: a "grand informational loop" bottlenecks in the intralaminar nucleus of the thalamus, which has the function of uniting modular representations of sounds, colors etc. into an introspectively unified stream of phenomenal experience constituted by "polymodal" representations.

Baars' Global Workspace Model: The Extended Reticular-Thalamic Activating System is a global broadcaster. Its activity determines, which of the more modular representations generated by the mind enters into phenomenally conscious experience.

O&O's Multitrack Model: Churchland and Baars are "led astray" by "their unquestioning allegiance to the orthodox conception of the unity of consciousness…The sense in which it is correct to talk of a 'unified' consciousness, one incorporating elements from the different modalities, is that in which the representational contents of the various components coincide: we

see our bodily parts in positions we feel them; we hear sounds emanating from objects in the direction we see them; we taste the food we can feel in our mouths; and so on."

On this understanding, phenomenological or introspective unity is fully explained in terms of the coherence of experience as we introspect upon it. Experience is itself a composite of modal representations which are not unified by anything and so not unified by the Thalamic loop.

Evidence for the Multitrack model: (1) Phenomenological: discreteness between modalities and even within modalities as when noticing the differences and similarities between pre- and post-Gestalt switch visual experience allowing one to discriminate between "primary and secondary" processing. (2) Neurological: Semir Zeki's patient who cannot sense motion visually but is aware of other properties of visual stimulus. (3) Damage to striate cortex: instead of integrated percept the patient sees circular motion, then a pure Ganzfeld, the film color patches, then colored surfaces. The object's representation is not immediate (citing Smythies, 1994, 318). (4) Synthesthesia: Michael who feels objects close to his body that he can touch but cannot see when he tastes things. In this case there is no coherence between touch and vision but subject has both visual and tactile phenomenology at the time.

Discreteness within the visual modality: In "The Disunity of Consciousness," (2003), Zeki argues that visual awareness of motion (or the phenomenally conscious experience of motion) is distinct from visual awareness of color (or the phenomenally conscious experience of color). "We are conscious of these two attributes at different times, because of spatially and temporally different mechanisms" (2003, 214). Color awareness is realized in V4, whereas motion is represented in V5. There are few, if any connections between V4and V5 in monkey brains (Zeki, 2003, 216). Damage to V4 leads to acquired color blindness (achromatopsia) leaving visual perception of motion unimpaired, where damage to V5 leads to the inability to visually perceive fast motion (akinetopsia) leaving color perception intact. Patient GY has awareness of rapid motion in one hemifield despite being otherwise blind in that hemifield because of childhood damage to the primary visual cortex. V5 has a direct input from the eyes that bypasses the primary visual cortex (in addition to the input which runs through V1). Color is perceived about 80 milliseconds faster than motion, and is also perceived before orientations of the stimulus in comparison to the observer, though the locations of stimuli are perceived before their colors. If given 500 milliseconds to perceive stimuli these attributes are "bound" together into a state of "macroconsciousness," but Zeki thinks of binding as a post-conscious integration of distinct micro-consciousness of the attributes in question rather than a pre-conscious process that then "broadcasts" the bound representations "into" consciousness. He cites as evidence the observation that distinct colors are bound together and components of motion are bound together **before** color is bound to motion; citing his work with Bartels, which is not explicated in this article. I have been unable to access this article through the library but the claim seems somewhat incredible.[1] At any rate, Zeki uses this "result" to posit levels of binding which all operate on representations of stimuli which *already* manifest in consciousness before being bound. Level 1 is Intra-attribute Binding (e.g., one color to another color in a scene); Level 2 is

[1] Bartels, A. and Zeki, S. (2002) The temporal limits of binding: is binding post-conscious? Soc. Neurosci. Abstr. 260, 11

intra-modal but inter-attribute (visually perceived motion with visually perceived color); Level 3 is intermodal (e.g., visual with auditory).

Zeki draws several inferences from this double dissociation of color perception from motion perception. First, he infers that "processing sites are perceptual sites," which is a rejection of the "integrationist" or "unificationist" accounts of perceptual consciousness attributed to Churchland and Baars above. He cites binocular rivalry as further evidence for this: when coherent images are presented to both eyes (e.g. a red house or face against a green background), the patient sees the image, but when the images "cancel" each other (e.g. one eye gets a red house against a green background and the other gets a green house against a red background) the patient only sees yellow. Zeki says the classificatory areas of the brain are similarly active in both conditions, so this is evidence for "localized" processing.

O&O Conclusion 1: "Consciousness depends on a multitude of distributed mechanisms. The deficits and dissociations that sometimes occur in experience are to be explained entirely in terms of the damage to these localized content-fixing mechanisms, and not in terms of the failure of informational content to be passed on and re-presented elsewhere in the brain" (389).

O&O approve of Dennett's Multiple-drafts account in *Consciousness Explained*.

O&O Conclusion 2: It is a mistake to identify your sense of yourself as a single person with a single mind. "The unity of the cognitive subject…should not be illicitly transferred to consciousness" (394).

Questions: Does Nagel make this confusion when he says we cannot make sense of the results of brain bisection? Is it possible that what we have in that case is a (fairly) unified cognitive subject (where unity breaks down in experimental contexts designed to elicit disunity) with disparate visual experiences? "What is it like to see the world as the brain bisection patient does?" may not have an answer because of the way we answer such questions with acts of imagination sourced in our perceptual experiences. Instead, perhaps we can only say what it must be like to be one or the other of the hemispheres.

3. Bayne and Chalmers Defend the Unity of Experience in Spite of Brain Bissection Results

"By far the most common reason for holding that the unity of consciousness can break down is grounded in neuropsychology. It is widely held that patients in various unusual neuropsychological states have a disunified consciousness. The paradigm case here is that of a *split-brain* patient, whose corpus callosum has been severed for medical purposes, preventing the left and right hemispheres of the cerebral cortex from communicating directly (although there is still some connection through lower areas of the brain). Such a patient behaves in a surprisingly normal fashion much of the time, but in certain circumstances they behave quite unusually. For example, when presented with different pictures in different halves of their visual field (e.g., a cat on the left and a dog on the right), and asked to report the contents, the patient will report seeing only a dog, since the left hemisphere, which dominates speech, receives input from the right visual field. When asked to write down what they see with their left hand (which is controlled by the right hemisphere), such a patient may slowly write "CAT"; with the right hand, the patient may write "DOG". If a patient writes with her left hand in her right visual field, a conflict may occur when the patient sees what is written, and in some cases the right hand scratches out what the left hand has written.

It is often held that in cases like this, consciousness is disunified. On one interpretation (e.g. Puccetti 1981), there are two distinct subjects of consciousness, corresponding to each hemisphere. Such an interpretation is actually

compatible with the unity thesis, since the unity thesis requires only that every subject have a unified consciousness. More threatening to the unity thesis are intepretations on which there is a single subject with a disunified consciousness. Some (e.g. Marks 1980) hold that the subject has two separate streams of consciousness, at least under experimental conditions. Others (e.g. Lockwood 1989) hold that the subject has a fragmented consciousness with nontransitive unity between the states: for example, the experiences of "CAT" and of "DOG" might each be unified with some background emotional state, but not with each other. Others (e.g. Nagel 1971) hold that our conceptual framework in speaking of subjects may simply break down in this area.

Adjudicating this question requires a very detailed examination of both the empirical details and the philosophical analysis of these phenomena, which we cannot provide here. Here, we will simply note that given what we have said so far in this paper, the advocate of a phenomenal unity thesis has a natural line of response.

It is plausible that in split-brain cases, there is some sort of breakdown of *access* unity. If we assume that there is a single subject, then it seems that the subject in the case above has at least a weak sort of access both to the presence of a cat and to the presence of a dog, and can use each in reasoning and in the control of behavior. But it seems that the subject has no access to a conjunctive content involving both the cat and the dog. The conjunctive content is not reported, and plays no apparent role in reasoning and in the control of behavior. So this may well be a case in which access unity fails. In this case, it seems that two accessed contents are not jointly accessible, because of a disconnection between the relevant access mechanisms.

But as we have seen, a breakdown of access unity does not entail a breakdown of phenomenal unity. So the possibility remains open that split-brain subjects have a unified phenomenal field, with some sort of conjoint phenomenology subsuming each of the separate contents. It is just that the subject has pathologies of access, so that the contents of the field are accessible only singly and not jointly. If so, the subject in the experiment described has a phenomenal field that includes experiences of both "CAT" and "DOG". The subject simply has no conjoint access to these contents. Of course this implies that the subject has highly imperfect knowledge of her conscious states: she will believe (in both "halves" of the brain) that she is experiencing only one word, when in fact she is experiencing two. But it is plausible for many other reasons that knowledge of consciousness is fallible, and it is not unreasonable to suppose that in cases of brain damage, this fallibility might be quite striking.

Of course nothing here proves that this interpretation is correct. It does suggest, however, that we should not be too quick to conclude that these cases involve a breakdown of phenomenal unity. Most of those who have discussed these cases have not carefully distinguished the relevant notions of unity and consciousness (an exception is Marcel 1994, who distinguishes "reflexive consciousness" from "phenomenal experience" and argues that the disunity concerns the former), and have often discussed things in terms of access and related functional notions. Once we distinguish access unity from phenomenal unity, it becomes clear that the direct evidence concerns access disunity, not phenomenal disunity. To establish phenomenal disunity requires substantial further argument. It may be that such arguments can be given, but the case is far from clear."

Question: According to Bayne and Chalmers, the split-brain patient has a visual experience of both the cat presented in the left visual field and the dog presented in the right even though she cannot access her experience of the cat to report that she sees it. Given what we know about the independence of the two hemispheres, how plausible is this interpretation?

Further questions: How plausible is Puccetti's (1981) interpretation on which there are two discrete subjects realized in each hemisphere, each with a unified consciousness? How plausible is Marks' (1981) interpretation on which there is one subject with two distinct streams of consciousness? Based on the complex pattern of unities and disunities reported by Gazzaniga, I

lean toward the interpretation here attributed to Lockwood (1989), who says there are two distinct but overlapping streams.[2]

4. Brain Bissection and the Neural Localization of Psychological Functions

Left hemisphere has "marked limitations in perceptual processing functions."

Right hemisphere has "even more prominent limitations in its cognitive functions." Most notably, the right hemisphere is mute; speech production is limited to the left hemisphere, though right hemisphere does process or comprehend speech and is specialized for facial recognition.[3]

Question: Why can one-year-old children perform certain classificatory tasks on the level of a rhesus monkey but the right hemisphere of a brain bisection patient cannot perform these tasks?

Gazzaniga's initial hypotheses: (1) The brain is flexible and allows modules to specialize. The left hemisphere focuses on language and "co-opts" cognitive abilities that would otherwise be executed in the right hemisphere. This, in turn, allows the right hemisphere to focus on perceptual and attentional functions: e.g. face recognition. "**An overarching principle of brain evolution: cortical space is co-opted for new purposes**" (2000, 1295). (2) The functions executed by the human brain are even more localized in nature than the brains of other animals. "Humans show a marked *decrease* in the rate of growth of the corpus callosum compared with intrahemispheric comparisons of white matter…Adaptations…become laterally specialized systems" (2000, 1294-5). A major difference between the visual system of monkey and human is that the intact human anterior commissure in the monkey transfers information of all kinds. The intact human anterior commissure appears to transfer nothing visual" (2000, 1295).[4]

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[2] Lockwood, M. 1989. *Mind, Brain, and the Quantum*. Blackwell. Marks, C. 1980. *Commissurotomy, Consciousness, and Unity of Mind*. MIT Press. Puccetti, R. 1981. The case for mental duality: Evidence from split-brain data and other considerations. Behavioral and Brain Sciences 4:93-123.

[3] "Kingstone and colleagues have demonstrated that the right hemisphere, which is superior to the left hemisphere for processing upright faces, shifts attention automatically to where someone is looking (Kingstone *et al.*, 2000). The left hemisphere does not demonstrate a similar attentional response to gaze direction" (Gazzaniga, 2000, 1302). See too the superiority of the right hemisphere in amodal completion of Kanizsa rectangles (Gazzaniga, 2000, 1305) and mirror reversal (Gazzaniga, 2000, 1305). But note that the left hemisphere also recognizes faces and is superior in recognizing familiar faces. "In the perceptual domain, it appears that the right hemisphere has special processes devoted to the efficient detection of upright faces (Gazzaniga, 1989). Although the left hemisphere can also perceive and recognize faces and can reveal superior capacities when the faces are familiar, the right hemisphere appears to be specialized for unfamiliar facial stimuli (Levy *et al*., 1972; Gazzaniga and Smylie, 1983). This pattern of asymmetry has also been shown for the rhesus monkey (Hamilton and Vermiere, 1988)" (Gazzaniga, 2000, 1306).

[4] "Experiments indicate that the left hemisphere demonstrates striking deficits in simple visuospatial tasks. It is noteworthy that experiments with split-brained monkeys have sometimes revealed superiority of the *left* hemisphere for spatial judgements (e.g. Hamilton and Vermeire, 1991; Vogels *et al*., 1994). The studies by Funnell and colleagues (Corballis *et al*., 1999; Funnell *et al*., 1999), as well as the preponderance of previous evidence from our laboratory and others, suggest that this is reversed in humans. Although this difference should not be over-interpreted, it is consistent with the idea that the evolution of language in the left hemisphere has resulted in the loss of some visuospatial abilities it once possessed" (Gazzaniga, 2000, 1306).

(Gazzaniga also hypothesizes that awareness of the minds (intentions, beliefs etc) of conspecifics is unique to humans and realized in simulations executed in the prefrontal cortex.)

Problems for the Two Minds or Two Streams of Consciousness View

"The discovery that spatial attention can be directed with ease to either visual field raised another question: can each separate cognitive system in the split-brain patient independently direct attention to a part of its own visual field (Holtzman *et al*., 1984)? Can the right hemisphere direct attention to a point in the left visual field while the left brain simultaneously attends to a point in the right visual field? Normal subjects cannot so divide their attention. Can split- brain patients do so?

The split-brain patient cannot divide spatial attention between the two half-brains (Reuter-Lorenz and Fendrich, 1990). There appears to be only one integrated spatial attention system that remains intact after cortical disconnection (Fig. 6B). This is consistent with electrophysiological studies showing that event-related potentials associated with simultaneous target detections in the two visual fields are not elicited independently in the separated hemispheres (Kutas *et al*., 1990). Thus, like neurologically intact observers, the attentional system of split-brain patients is unifocal. They cannot prepare for events in two spatially disparate locations…

when one half-brain was working on processing only one repeated stimulus, the opposite hemisphere was better at recalling whether the probed stimulus was part of the original three stimuli. When both hemispheres were trying to process three stimuli, the performance of each hemisphere was impaired. These findings have been replicated in a monkey model of the tasks (Lewine *et al*., 1994).

Other experiments address attentional sharing (Pashler *et al*., 1994; Ivry *et al*., 1998). Split-brain patients have a psychological refractory period effect between the two hemispheres, an indication that tasks being presented to each half-brain alone are being correlated. When one hemisphere discriminates a stimulus and makes a choice, this delays the other hemisphere in making a similar choice. At the same time, the patients fail to exhibit attentional costs between the hemispheres. For example, split-brain patients do not show the cost that normal subjects reveal when they use two hands for the two responses: they maintain incompatible response codes for each hand….The evidence suggests that reflexive attentional orienting happens independently in the two hemispheres, while voluntary attentional orienting involves hemispheric competition with control preferentially lateralized to the left hemisphere. These data explain not only the low-level sensory effects of attentional orienting but also bear on more complex behaviours, such as visual search. For instance, when the number of items to be searched is small, attentional orienting is largely reflexive in nature, and the two hemispheres perform independently (Luck *et al*., 1989, 1994). But when the number of items to be searched is large, or the search is strategic, attentional orienting is largely volitional and attentional orienting is lateralized to the left hemisphere (Kingstone *et al*., 1995). Mangun and colleagues have also shown that the right hemisphere has a predominant role in attentional orienting (Mangun *et al*., 1994). Indeed, even in callosally sectioned patients, the right hemisphere attends to the entire visual field whereas the left hemisphere attends only to the right field. This finding has also been noted by Berlucchi and colleagues (Berlucchi *et al*., 1997) and by Corballis (Corballis, 1995)" (Gazzaniga, 2000, 1300-2).

Questions: Can there be two discrete visual consciousnesses without two discrete foci of visual attention? What would it be like to have one such stream while sharing attentional resources with a disparate experiential subject? Does the left hemisphere experience this as an inability to fully focus when the right hemisphere is focused (and vice versa)? No doubt, O&O are right to distinguish the focus from the periphery of a subject's overall conscious experience at a time and to draw a similar distinction within visual consciousness, but how exactly do attention and phenomenal consciousness relate to one another? It would seem, phenomenologically, that to manifest within conscious experience, a stimulus must occupy at least some portion of one's attention. Do the results of brain bisection challenge this assumption?