

**(A) HARDIN'S DICHOTOMY**

- [1] THERE ARE NO COLOURS IN EXTERNAL BODIES
- [2] THERE ARE NO COLOURS IN VIEWERS (SENSATIONS ARE NOT THE BEARERS OF COLOURS)
- [3] [1] AND [2] EXHAUST THE OPTIONS, **SO**:
- [4] THERE ARE NO COLOURS

For sketch of Hardin's grounds for [1], see accompanying sheet. Damaging implications follow for

- Direct Realism
- Disjunctivism
- Intentional-Representationalism

I deny [2] and assert that sensations are the bearers of colours.

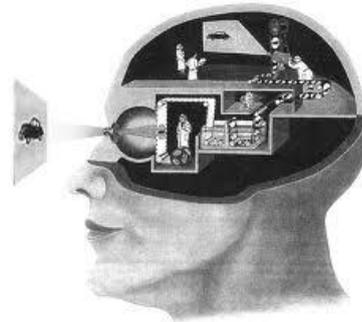
**[B] OBJECTIONS TO SENSE DATUM THEORY, SENSATIONS AS COLOUR-BEARERS, or (loosely) REPRESENTATION *BY* COLOURS NOT *OF* COLOURS**

- i. Immaterialist
- ii. Implies Skeptical 'Veil of Appearances'
- iii. Depends on Argument from Illusion which is unsound
- iv. Refuted by perceptual phenomena, by Hardin
- v. Requires a Cartesian Theatre/homunculus

**SPURIOUS**

- I. Answer: False; (ONE) relies on Descartes' ill motivated doctrine of unique primary attributes, and structureless soul; (TWO) Prichard's Diagnostic: we mistake our sense data for the external world (Prichard: "What is that which when we are said to see a body we see and mistake for a body?") When we mistake our sensations or sense data for attributes or objects in the external world, we have absolutely no sense of anomaly when we attribute physical variables to them. There is nothing discernibly non-physical that we are aware of in the intuitable character of sensations. Consider, the Direct Realist without dualist disquiet takes the 'Phenomenal Array' to be the Visual Field (i.e. array of distal stimuli). In fact, the Phenomenal Array is an array of sensations or sense data, not discernibly immaterial. [What do you mean by the 'Phenomenal Array'? I mean that array that you mistake for the world outside you at any given

- time. Quibble about 'mistake', but it suffices to pick out the Phenomenal Array.]
- II. Answer: hypothetico-deductive inference, grounded in Bayes' Updating and Theorem (not Inference to the Best Explanation – explanation is inessential for evidential relations.)
- III. Answer: That there is no sound Deduction from the Phenomena from Illusions/Hallucinations (cf Newton on force law exponent, Ampere on interaction of current elements, Poincare on discontinuity from Planck's Law, ...) is no obstacle to the applicability of typical and conventional inductive inferences. All invalid.
- IV. Answer: Inconclusive ("Sensations as the bearers of colours", PhQP, U. Herts, 18 Nov. 2010.)
- V. False: Requires a Cartesian 'Theatre'. **Being aware of** the phenomenal



array (i.e. sense datum array) is not **seeing**; it is a functional module within **seeing** (contrast Jackson 1977: seeing sense data as constitutive of seeing distal objects). Cartesian 'Theatre' no more a Theatre than the 'Mind's Eye' is an Eye.

However, a legitimate criticism of SDT is that it is hard to find a locus in the brain (yes, in physical space) at which a unitary experience of a unitary sensory field can be constructed, assuming the simplest topological hypothesis.

DAMASIO: (208) "... there is no neuroanatomical structure in the cerebral cortex to which signals from all the sensory modalities that may be represented in our experience can converge, spatially and temporally. The entorhinal cortex and the hippocampus might be candidates for the sort of "integrative" role but they do not pass the necessary anatomical tests. Also, we know for certain that they cannot do the job because patients in whom such structures are destroyed bilaterally ... do not have a disturbance of consciousness ... The prefrontal cortex, another region associated with consciousness in the minds of most people that have ever thought about the brain, is an even less adequate candidate than the entorhinal cortex for the "integrative" locus underlying a Cartesian Theater. It

provides many anchor points for signals hailing from various sensory streams and from the motor system, but there is no single site to which “representations” can cohere spatially and temporally. Extensive bilateral ablation of prefrontal cortices in humans does not preclude basic consciousness, although, again, we have argued that the highest levels of self-consciousness are not possible within these structures”.

ARCHIPELAGOS VS. SITES

Some authors assume an **archipelago** of disjoint sites in the brain as the (functional) underpinning of the phenomenal array (Block, Zeki, Damasio, and, implicitly, Merker). However, they give few if any clues how the constitution of the phenomenal array is established.

Zeki is arguably the most exotic advocate of the archipelago conception: the archipelago is an array of ‘microconsciousnesses’ which instantiate sensory modalities one at a time. Thus we have experiences of motion from V5, and colour from V4 disjointly.

“... a lesion in one area does not invade and disable the perceptual territory of the other. Thus an a kinetopsic patient sees colours consciously even though unable to perceive and be conscious of (fast motion). By contrast, an achromatopsic patient is unable to perceive and be conscious of colours but is able to see and be conscious of visual motion effortlessly. Hence consciousness of these elementary visual attributes are distinct from one another and I speak of them as ‘microconsciousnesses’. One conclusion from the clinical evidence is that a microconsciousness for colour or visual motion is generated at a distinct processing site, and therefore that a processing site is also a perceptual site.” [! – JMN]

(He is encouraged in this by the subjective reports of cortically blind Riddoch Syndrome victims, who purport to experience motion with no other attributes in their scotomas.) Further assembly is required, to get the integrated percepts, but the assembly is at the experiential (phenomenal) not at the processing (access) level. He is not alone in this.

Temporal disparities in processing times for different sense modalities (lag times of about 30 ms and 40ms, respectively, between colour and orientation, and orientation and motion) prompt Zeki to endorse a temporal archipelago too.

MERKER vs CORTICO-CENTRISM: Is the archipelago model a symptom of (almost) exclusive attention to the cortex?

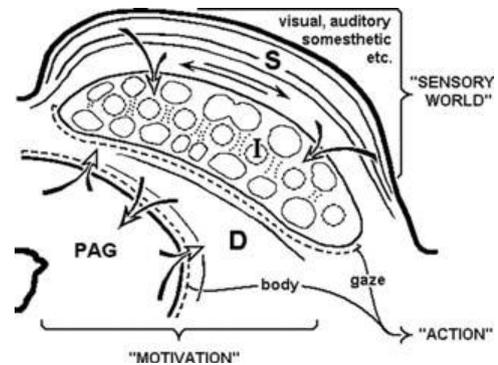
Sprague Effect: Removal of cortex causes inability to detect and track visual targets: subsequent lesion at

contralateral superior colliculus restores visual ability (cats and one human).

Hydranencephalics: consciousness without cortex?



Look to tectal area, with superordinate role for superior colliculus (there are two, left and right of the pineal body!).



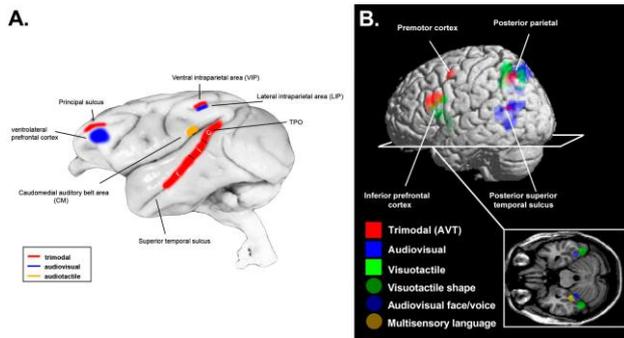
Target selection / action selection, sensory input, and motivational state input yield motor output to hindbrain and spine. The pooling of these elements is made possible in phenomenal consciousness – “a neural analog reality simulation” – employing a common coordinate system with origin “lodged in the head representation of the simulated analog visual body, say in close proximity to its analog eye region. ... the implicit ‘ego-center’ origin [being] the position we ourselves occupy when we are conscious, and that the analog body and analog world of that space is what we experience as and call our tangible, concrete body and the external world ... It cannot be an object of consciousness any more than an eye can see itself ” p.72

CO-LOCATION IN THE SUPERIOR COLLICULUS, NOT THE CORTEX “The superior colliculus is the only place outside of the cerebral cortex in which fast oscillations in the gamma range have been shown to occur and to behave in a manner paralleling in all significant respects that of the cortex ... Though sometimes portrayed as “the” problem of consciousness, the acuteness of the cortical binding problem must not be exaggerated. The pyramid architecture of point-to-point interareal connectivity within topographically organized cortical sensory domains ensures that corresponding points on

areal topographies featuring different functional content (e.g., contour and color) are connectively and thus coherently related, even though the areas themselves occupy separate locations in the cortical sheet ... The laminar superposition of numerous cortical areas in the colliculus takes this principle further. Here the joining of corresponding points on different cortical maps takes place by direct laminar superposition of topographic projections of different cortical areas within a unified collicular topography. Thus, the output of different cortical areas are brought within the compass of the dendritic trees of single collicular neurons, which often straddle collicular laminar boundaries ... Synchronous activation of corresponding loci on separate cortical maps would accordingly assist such activity in crossing collicular thresholds by summation via the dendritic trees of convergently innervated collicular cells.” Merker, pp. 76-77.

Has Merker offered the sort of resources required to constitute the phenomenal array at a topologically simple unitary site in the brain?

MULTIMODALITY

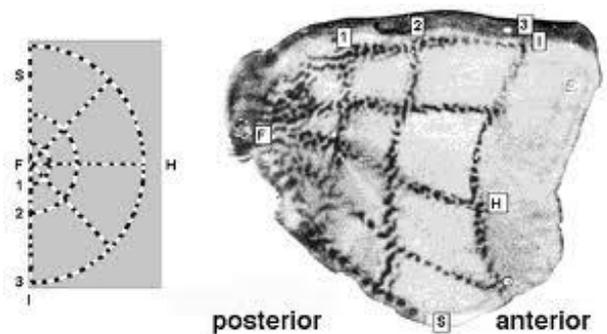
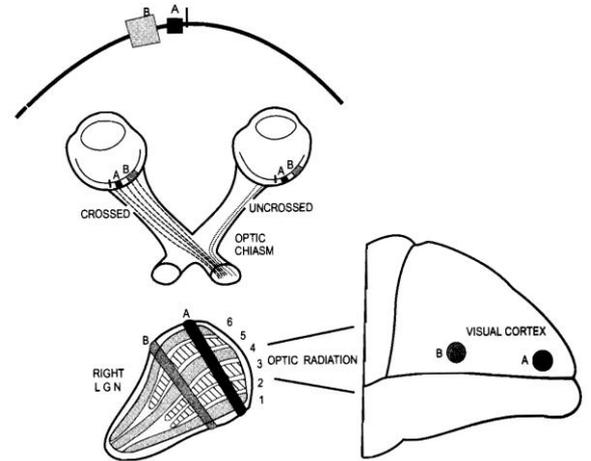


Yes. “the only site in the brain in which the spatial senses [visual, auditory, somatosensory – JMN] are topographically superposed in laminar fashion within a common, premotor, framework for multi-effector control of orienting ...” Merker, p. 67.

Will the superior colliculus do? No. Each superior colliculus maps matching retinal hemifields (i.e. left or right) only. There are callosal connections between left and right s.c. but that doesn’t help us form a unitary neural array underpinning a unitary phenomenal array.

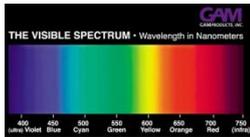
(Another difficulty is that the collicular outputs are **motor** outputs to hindbrain and spine; recall that the s.c. is important in determining gaze, visually addressing a target by head orientation, and saccades. Presumably the construction of an array of sensations will require rather different kind of output.)

The s.c. is problematic as a base for the phenomenal array because it inherits the early effects of ‘decussation’ in the structure of the optic chiasm, which assigns right retinal hemifields of both eyes to left cortex, and left to right (i.e. contralaterally).

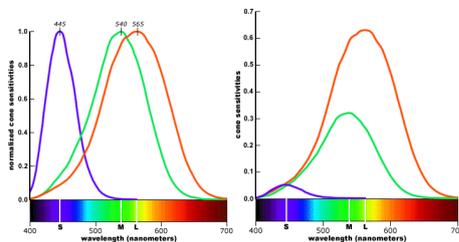


**THE CASE FOR [1]: There are no colours in external bodies.**

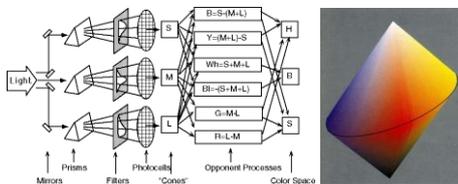
**[I] NOT FREQUENCY OF LIGHT:**



A necessary condition for identity is implicit in the above common diagrams: mapping frequency to hue.



Retinal cone responses suppress frequency information.

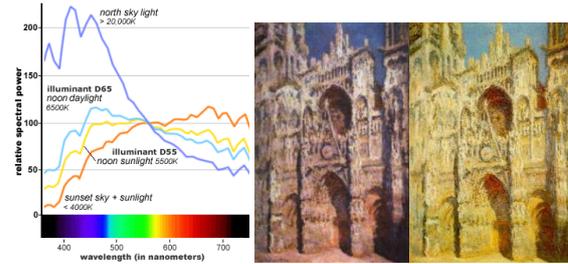


Hue (as well as saturation and brightness) is determined by sums and differences of the relative activation of the three kinds of cones. Innumerable combinations of frequencies will yield identical colour: the metamerism problem. For example, the effect of a monochromatic beam ( $\lambda = 577\text{nm}$ , 'pure' yellow) can be duplicated by two beams ( $\lambda = 540\text{nm}$  red,  $670\text{nm}$  red), not including the original.

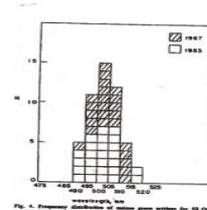
**[ii] NOT THE EFFECT OF DISTAL STIMULI ON NORMAL PERCEIVERS UNDER NORMAL CONDITIONS**

There is no principled basis for normality [rather than conventional 'standardness'] of conditions, or of observer.

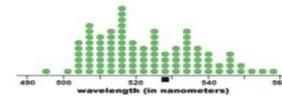
(Rhetorically) Which is normal illuminant (for Rouen Cathedral)?



There is no principled basis for normality of perceiver. Consider the two following spreads for unique green:

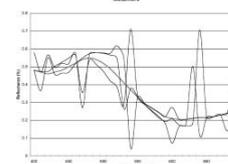


Hurvich, Jameson and Cohen "The experimental determination of unique green in the spectrum" *Perceptual Psychophysics* 4(1968), 65-68, p. 66.

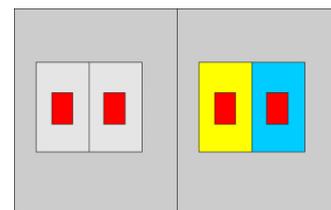


Handprint "Color2" after Volbrecht, Nerger & Harlow (1997)

**[iii] NOT SURFACE REFLECTANCE**



Surface metamerism: identical colour but dissimilar reflectances (for a given illuminant)



Simultaneous Colour Contrast; one illuminant, same reflectance, **two** colours! Colour of light sources?

**[iv] DEPENDENCE OF COLOUR ON OPERATING CHARACTERISTICS OF THE VISUAL SYSTEM**

