Phil 296D: Phil Mind Seminar W 21 Prof. Aaron Zimmerman
Office Hours: By Appointment Office: https://ucsb.zoom.us/j/5972101028

Handout #1: Huxley's "On the Hypothesis that Animals are Automata and Its History" (1874)

1. Huxley's Initial Historical Theses: (A) In the 17th century scientists came to accept that "the physical processes of life are capable of being explained in the same way as other physical phenomena," and (B) Given the models of physical phenomena then operative, this meant that 17th century scientists began to treat the living human body as a mechanism or set of mechanisms.

Huxley cites William Harvey's explanations of circulation as the driving force of this change as it lent confidence to scientists pursuing mechanistic explanations of metabolic and reproductive processes. Of course, some people continued to doubt the adequacy of mechanistic explanations of various organic processes (as some people continue to do today), but Huxley maintains that the idea was "proved true."

Question: Which idea was proved true? I guess it is supposed to be the hypothesis that for each physiological process that we can identify, we can, if we are sufficiently diligent and resourceful, uncover an adequate "mechanistic explanation" for it. Perhaps Huxley is right that this assumption began to take hold in the 178rh century, though he goes beyond intellectual history, and takes a stand on the nature of biology, by insisting that the adequacy of mechanistic explanation was "proved true" and became established "fact." At any rate, according to Huxley, what remained controversial two-hundred years earlier, when Descartes (1596-1650) was conducting his research was the extension of mechanistic explanations to human action.

"But the living body is not only sustained and reproduced: it adjusts itself to external and internal changes; it moves and feels. The attempt to reduce the endless complexities of animal motion and feeling to law and order is, at least, as important a part of the task of the physiologist as the elucidation of what are sometimes called the vegetative processes" (200).

Huxley's Primary Historical Thesis: "[Descartes is] certainly entitled to the rank of a great and original physiologist; inasmuch as he did for the physiology of motion and sensation that which Harvey had done for the circulation of the blood, and opened up that road to the mechanical theory of these processes, which has been followed by all his successors… It is a matter of fact that the greatest physiologist of the eighteenth century, Haller, in treating of the functions of nerve, does little more than reproduce and enlarge upon the ideas of Descartes" (201-3).

2. Huxley's Demonstration that Cartesian Theses Constitute the "Foundation and Essence" of Modern Physiology

Cartesian Thesis I. *The brain is the organ of sensation, thought, and emotion; that is to say, some change in the condition of the matter of this organ is the invariable antecedent of the state of consciousness to which each of these terms is applied.*

Comment: Descartes used neuroscientific techniques to locate mentality in the brain. This was an advance in terms of theory, even if its still denied by relationalists and externalists of various sorts who identify mental states or events with organism-environment relations. But it is equally important to recognize that his methods were not limited to the kinds of epistemological reflection he utilized in the Meditations to argue for dualism. Instead, Descartes was a cognitive neuroscientist who would have rejected any sharp

division between neuroscience (or biology more generally) and philosophy of mind. To this end, Huxley cites Descartes' claim that his dissection table was his library.

Cartesian Thesis II: *The movements of animals are due to the change of form of muscles, which shorten and become thicker; and this change of form in a muscle arises from a motion of the substance contained within the nerves which go to the muscle.*

Huxley: "Our conceptions of what takes place in nerve have altered in the same way as our conceptions of what takes place in a conducting wire have altered, since electricity was shown to be not a fluid, but a mode of molecular motion. The change is of vast importance, but it does not affect Descartes' fundamental idea, that a change in the substance of a motor nerve propagated towards a muscle is the ordinary cause of muscular contraction."

Cartesian Thesis III: *The sensations of animals are due to a motion of the substance of the nerves which connect the sensory organs with the brain.*

Huxley: "The great fact insisted upon by Descartes, that no likeness of external things is, or can be, transmitted to the mind by the sensory organs; on the contrary, that, between the external cause of a sensation and the sensation, there is interposed a mode of motion of nervous matter, of which the state of consciousness is no likeness, but a mere symbol, is of the profoundest importance. It is the physiological foundation of the doctrine of the relativity of knowledge, and a more or less complete idealism is a necessary consequence of it. For of two alternatives one must be true. Either consciousness is the function of a something distinct from the brain, which we call the soul, and a sensation is the mode in which this soul is affected by the motion of a part of the brain; or **there is no soul, and a sensation is something generated by the mode of motion of a part of the brain**. In the former case, the phenomena of the senses are purely spiritual affections; in the latter, **they are something manufactured by the mechanism of the body, and as unlike the causes which set that mechanism in motion, as the sound of a repeater is unlike the pushing of the spring which gives rise to it**. The nervous system stands between consciousness and the assumed external world, as an interpreter who can talk with his fingers stands between a hidden speaker and a man who is stone deaf–and Realism is equivalent to a belief on the part of the deaf man, that the speaker must also be talking with his fingers."

Question: What is meant by Huxley in saying (a) that a "state of consciousness" is a "mere symbol" of the nervous activity that realizes it and (b) that our states of consciousness are "no likenesses of these nervous activities? Might (b) be true and (a) be false? And how can Huxley arrive at thesis (a) without invoking a conception or theory of representation (i.e., an account of what it is for one thing to be a symbol of another)? Is such a theory possible? Is it a matter for philosophy? Or is there a science of representation (e.g., "informatics") that might be integrated with the neuroscience of perception to establish this thesis?

Task: Assess Huxley's argument against representational realism, grounded, as it is, in his claim that the neurological realization of perception is "interposed" between states of sensory or perceptual consciousness and the distal object sensed by the perceiving animal. Is Huxley right that an investigation into the neuro-mechanics of vision and other perceptual processes undermines or even refutes a view on which we are directly acquainted or apprehend (two-dimensional) images through which we perceive the (3-d) objects that resemble them? What are some alternative views of perception beyond representational realism and idealism? Isn't that a false dichotomy? Is "idealism" defined as the view that "the phenomenal world is constructed by the ego" the natural consequence or even a logical implication of knowledge of the neurological processes essential to perception and other forms of conscious mental activity?

Cartesian Thesis IV. ***The motion of the matter of a sensory nerve may be transmitted through the brain to motor nerves, and thereby give rise to contraction of the muscles to which these motor nerves are distributed; and this reflection of motion from a sensory into a motor nerve may take place without volition, or even contrary to it.***

Huxley emphasizes Descartes' analysis of the game "made you flinch" to identify reflexive actions or relatively automatic actions in which "volition" is either absent altogether or greatly diminished. (The latter category is important if we want to include habits and the absent-minded deployment of manual skill (walking, knitting, etc.)) According to Descartes, this means the soul is not involved. Stripped of the dualism, a distinction between automatic and controlled action remains central to cognitive neuroscience. The canonical text, Kandel et al Principles of Neuroscience, 5th Edition, Part V. Movement, contains a chapter on spinal reflexes, locomotion, and then several on voluntary movement, followed by chapters on control of gaze, balance. posture among chapters dedicated to the cerebellum, the basal ganglia, degenerative motor disease and so on. The "voluntary/non-voluntary" distinction (or at least comparative voluntariness or control) remains central to our understanding of the mind/brain. Huxley reports that this was also true of the science of Huxley's day. Descartes' hypotheses about the mechanisms involved in motor activity (animal spirits etc.) were already passe, but explorations of various reflexes and unreflective or absent-minded behavior was already in full swing.

Cartesian Thesis V. *The motion of any given portion of the matter of the brain excited by the motion of a sensory nerve, leaves behind a readiness to be moved in the same way, in that part. Anything which resuscitates the motion gives rise to the appropriate feeling. This is the physical mechanism of memory.*

Huxley notes the respects in which Descartes had it right about the function of memory and had it wrong about the neural mechanisms involved. In 1874 Huxley reports, "Physiology is, at present, incompetent to say anything positively about the matter, or to go farther than the expression of the high probability, that every molecular change which gives rise to a state of consciousness, leaves a more or less persistent structural modification, through which the same molecular change may be regenerated by other agencies than the cause which first produced it." The canonical textbook today reports that "storage of implicit memory involves changes in the effectiveness of synaptic transmission," and that "Long-term storage of implicit memory involves changes in chromatin structure and gene expression mediated by cAMP-PKA-CREB pathway." The relevant chapter is written by Kandel and Siegelbaum. Kandel's work on these mechanisms (along with Siegelbaum and his other collaborators) won him a Nobel: https://www.nobelprize.org/prizes/medicine/2000/kandel/lecture/ Needless to say, the biochemical mechanisms that produce the strengthening and growth of synaptic connections are complicated and extremely interesting. At the end of his lecture, Kandel predicts that neurobiological theories of mind will dominate the 21st century, as we have only begun to scratch the surface and lots of people are sufficiently fascinated by the subject to dedicate the time and energy necessary to advance our understanding through experimentation and careful reasoning.

3. Cartesian Intellectualism and Cartesian Exceptionalism

After defending his claims about Descartes' importance to neuroscience, Huxley turns to a Cartesian doctrine that he says was more widely discussed than any other Cartesian doctrine in the centuries that passed between the careers of these two great scientists/philosophers. But it is not Descartes' metaphysical dualism that Huxley has in mind, nor Descartes' "interactionist" claim that mind and brain communicate through the pineal gland. Instead, Huxley turns to **Descartes' exceptionalism**: Descartes' believing in human minds while denying minds to non-human animals. Huxley reports this attention-sucking thesis as Descartes' "doctrine that brute animals are mere machines or automata, devoid not only of reason, but of any kind of consciousness."

Descartes' exceptionalism consists of three commitments: (1) Descartes denies intellect to animals because they are unable to construct sentences and therefore fail to exhibit whatever forms of reasoning depend on the construction and comprehension of sentences. (2) Descartes adopts the "intellectualist" thesis that intellect (so understood) is necessary for consciousness or mentality of any kind. (3) Descartes defends this intellectualist thesis by claiming that all behavior, with the exception of discursive reasoning and the other manifestations of intellect, can be accomplished without consciousness or mentality of any sort and is so accomplished by the other animals.

"When one who falls from a height throws his hands forward to save his head, it is in virtue of no ratiocination that he performs this action; it does not depend upon his mind, but takes place merely because his senses being affected by the present danger, some change arises in his brain which determines the animal spirits to pass thence into the nerves, in such a manner as is required to produce this motion, in the same way as in a machine, and without the mind being able to hinder it. Now since we observe this in ourselves, why should we be so much astonished if the light reflected from the body of a wolf into the eye of a sheep has the same force to excite in it the motion of flight? If we wish to learn by reasoning, whether certain movements of beasts are comparable to those which are effected in us by the operation of the mind, or, on the contrary, to those which depend only on the animal spirits and the disposition of the organs, it is necessary to consider the difference between the two…and then it will easily be seen, that all the actions of beasts are similar only to those which we perform without the help of our minds."

Huxley reports that the "Port Royalists" perpetrated great cruelty upon animals because they accepted Descartes' exceptionalism as we've described it.

Criticism: Descartes' last sentence is false. The other animals exhibit creative, flexible behaviors. Intellect, as defined by Descartes, is not necessary for creative, flexible behavior.

4. Huxley and the Road to Epiphenomenalism

Huxley begins his analysis of Cartesian Exceptionalism with a highly contentious methodological premise:

Huxley's Methodology: "It must be premised, that it is wholly impossible absolutely to prove the presence or absence of consciousness in anything but one's own brain, though, by analogy, we are justified in assuming its existence in other men."

Questions: What conception of "proof" or "absolute proof" does Huxley have in mind? Can you prove that you're conscious? First, you would have to analyze the vague term in question to extract a more determinate proposition amenable to proof. Also, don't we know of our own conscious feelings and thoughts via introspection or reflection? What does sensation, experience and introspection on reflection on sensation or experience have to do with proof? And if the answer to that question is "relatively little," why suppose that we can prove the "presence of consciousness" or the existence of our own minds to others? And is it really via analogy with our own minds that we believe in the minds of others? Doesn't the assumption run much deeper than any such argument via analogy insofar as relationships with caregivers structure our infancy so that we already believe in minds before we have the resources to consider any such argument? And how much credence or confidence, if any, might be added by any such **argument to this pre-discursive belief we have in the minds of those with whom we interact?**

Three Steps on the Road to Epiphenomenalism

1. Huxley argues that pain experience is realized in the upper brain rather than lower components of the nervous system and that peripheralist views of consciousness can be assumed false because they cannot be proven. (He does limit this generalization to vertebrates, which is good given the questions neuroethologists are still exploring about octopuses. (See, e.g., J. Birch, A. Schnell and N.S. Clayton, "Dimensions of Animal Consciousness," *Trends in Cognitive Sciences*, 24, 10 (2020), pp. 789-801; which has been uploaded to the course site and PGS's book on the octopus.))

2. Thus, if a portion of the spinal cord is disconnected from the anterior portions of the brain requisite for consciousness, we can assume that no consciousness is realized in it.

3. And yet, this spinal circuitry remains the "seat of remarkable powers." Huxley focuses on cases in which the patient cannot control a limb voluntarily and feels nothing in it but it still exhibits normal reflex action when stimulated.

"In order to move the legs in this way, a definite co-ordination of muscular contractions is necessary; the muscles must contract in a certain order and with duly proportioned force; and moreover, as the feet are drawn away from the source of irritation, it may be said that the action has a final cause, or is purposive. Thus it follows, that the grey matter of the segment of the man's spinal cord, though it is devoid of consciousness, nevertheless responds to a simple stimulus by giving rise to a complex set of muscular contractions, co-ordinated towards a definite end, and serving an obvious purpose."

This establishes:

4. **Huxley's intermediate conclusion**: consciousness is not necessary for complex, purposive behavior.

Huxley goes on to including the self-grooming, croaking and swimming of frogs and their ability to maintain balance as examples of these locally controlled behaviors, which, because of their local control, can be assumed to be executed without consciousness. He even replicates experiments demonstrating a kind of "blind sight" where the animal makes use of vision to successively avoid obstacles to its reflexive jumps despite being otherwise blinded via the partial detachment of the optic lobes.

"To the ordinary influences of light, the frog, deprived of its cerebral hemispheres, appears to be blind. Nevertheless, if the animal be put upon a table, with a book at some little distance between it and the light, and the skin of the hinder part of its body is then irritated, it will jump forward, avoiding the book by passing to the right or left of it. Therefore, although the frog appears to have no sensation of light, visible objects act through its brain upon the motor mechanism of its body."

Questions: Even if consciousness is not necessary for all purposive behavior (contra both panpsychists and the kinds of "biopsychists" PGS discusses (who think all living things are conscious)) mightn't it still prove necessary for certain kinds of purposive behavior? E.g., behavior of a certain level of flexibility or creativity or complexity? And if we want to talk of **degrees of mentality** and **degrees of consciousness** (or really break consciousness into components, each of which admits of degree (as Birch et al. do in the article cited above), must we revisit Huxley's argument for his initial conclusion that the spinal circuits don't realize consciousness of any kind? Watch Kandel's lecture and look at the biochemical complexity of even the simplest reflexive learning in a seasnail. There's much more complexity in the peripheral nervous activity underwriting the relatively automatic reactions of humans in the cases on which Huxley focuses, especially once he includes the behavior of patients experiencing fugue states.

Huxley takes these reflections to support Descartes' belief in the automatism of non-human animals.

"It is obvious, that had Descartes been acquainted with these remarkable results of modern research, they would have furnished him with far more powerful arguments than he possessed in favour of his view of the automatism of brutes. The habits of a frog, leading its natural life, involve such simple adaptations to surrounding conditions, that the machinery which is competent to do so much without the intervention of consciousness, might well do all."

Question: Are **all** of a frog's behaviors sufficiently rigid to be explained by modular mechanisms that can be engaged to successfully meet a frog's ends without the aid of consciousness or mentality (however defined)? I'm no expert but you might read this and evaluate the behavioral repertoire reported by Bragg: https://aaron-zimmerman.com/wp-content/uploads/2021/01/Notes_on_the_psychology_of_frogs.pdf

5. The Theory of the Double Brain

To expand the scope of mechanism in service of an eiphenomenalist analysis of consciousness, Huxley turns to Dr. Mesnet's reports on Sergeant F, who may have been R.L. Stevenson's inspiration for the story of Jekyll and Hyde: https://aaron-zimmerman.com/wp-content/uploads/2021/01/Jekyll-and-Hyde.pdf. The study of Sergeant F, and the view of him as containing a dumb right hemisphere mind alongside a smart left hemisphere mind, bears an interesting connection to Gazzaniga's interpretations of brain bisection, which we will read later in the quarter. (Indeed, we may want to describe Sergeant F as "bird brained" as birds lack a corpus callosum, raising the possibility, discussed by Birch et al. in the article cited above, that birds possess two independent spheres of consciousness.)

In an unjustified leap, Huxley hypothesizes that when Sergeant F is in a fugue state, his mind is devoid of consciousness altogether (or his brain is devoid of mentality altogether if mentality is defined in the Cartesian manner). Huxley admits the evidence for his hypothesis is not robust, be he thinks the posit is "perfectly justifiable" by "the analogy of the frog."

Question: Even if we accept Huxley's analysis of frogs, isn't it more likely that Sergeant F just has **less** consciousness or mentality in his fugue state than he does when alert?

Huxley's Secondary Conclusion: Descartes was right in assuming that non-human animals are machines or automata, but he was wrong to think that consciousness is exclusively human. Instead, consciousness comes in degrees, which emerge and develop through natural selection over the enormous intervals assumed by evolutionary explanations of the differences between species. We are all machines, though some machines are more conscious (or better endowed with mentality) than others.

It is strange, though, given Huxley's gradualist conception of consciousness, that he embraces epiphenomenalism. Why did consciousness evolve if it has no function? Why does Huxley assume that a frog can function **just** as well without consciousness or that a human can function just as well in a fugue state when it is clear to observation that people and other animals do not function just as well without consciousness, especially in those environments which are in some way "irregular"?

"It may be assumed, then, that molecular changes in the brain are the causes of all the states of consciousness of brutes. Is there any evidence that these states of consciousness may, conversely, cause those molecular changes which give rise to muscular motion? I see no such evidence. The frog walks, hops, swims, and goes through his gymnastic performances quite as well without consciousness, and consequently without volition, as with it; and, if a frog, in his natural state, possesses anything corresponding with what we call volition, there is no reason to think that it is anything but a concomitant

of the molecular changes in the brain which form part of the series involved in the production of motion. The consciousness of brutes would appear to be related to the mechanism of their body simply as a collateral product of its working, and to be as completely without any power of modifying that working as the steam-whistle which accompanies the work of a locomotive engine is without influence upon its machinery. Their volition, if they have any, is an emotion indicative of physical changes, not a cause of such changes…. The soul stands related to the body as the bell of a clock to the works, and consciousness answers to the sound which the bell gives out when it is struck…. It seems to me that in men, as in brutes, there is no proof that any state of consciousness is the cause of change in the motion of the matter of the organism. If these positions are well based, it follows that our mental conditions are simply the symbols in consciousness of the changes which take place automatically in the organism; and that, to take an extreme illustration, the feeling we call volition is not the cause of a voluntary act, but the symbol of that state of the brain which is the immediate cause of that act. We are conscious automata, endowed with free will in the only intelligible sense of that much-abused term–inasmuch as in many respects we are able to do as we like–but none the less parts of the great series of causes and effects which, in unbroken continuity, composes that which is, and has been, and shall be–the sum of existence."

Criticism: This is just false. The frog does not perform "quite as well" after brain damage. Sergeant F's behaviors are not unaltered by his brain damage. Consciousness does seem necessary for kinds of tasks we cannot successfully execute without paying attention to what we are doing. How does Huxley miss this?

Huxley's rejection of pragmatism: "As to the logical consequences of this conviction of mine, I may be permitted to remark that logical consequences are the scarecrows of fools and the beacons of wise men. The only question which any wise man can ask himself, and which any honest man will ask himself, is whether a doctrine is true or false. Consequences will take care of themselves; at most their importance can only justify us in testing with extra care the reasoning process from which they result. "

Questions: Is this methodological naivete responsible for Huxley's failure to adopt a more nuanced definition of "freedom" than "absence of external constraints to the satisfaction of desire" and his complete failure to define "consciousness" and "mentality" nor to discuss the ramifications of differing definitions of these terms for the interpretation of neurobiology? Does his fatalism prevent him from seeing the matter as a question of theory choice where choice of theory is not determined by evidence absent auxiliary theory and the invocation of epistemic virtues?