Crowdsourcing Consciousness: You Think, Therefore I Am

Justin M. Campbell
Utah State University

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For my parents, Bill and Amy.
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ABSTRACT

Crowdsourcing Consciousness:
You Think, Therefore I Am

by

Justin M. Campbell

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Capstone Mentor: Dr. Charlie Huenemann
Department: Philosophy, Psychology

The challenge to understand consciousness is a centuries-old interdisciplinary research program. The search entails fundamental questions about our nature — the desire to understand who we are has been around for nearly as long as experience itself. It is also one of the most important questions we can ask; meaning itself is predicated on having some sort of conscious experiencer for whom something can matter. Given the magnitude and intractability of explaining the paradox of how consciousness can be at once the most obvious thing in the universe, and also the most inaccessible, the endeavor is a tremendous undertaking. Until somewhat recently, there has been little cross-talk between these disciplines; and in the absence of collaboration, a territorial dispute has emerged. The purpose of this thesis is two-fold: first, to trace a narrative thread across the history of thought by exploring philosophical theories dating back to ancient Greece, through the authoritatively scientific thought of the modern day. The second aim of this project is one of consilience, wherein by starting a dialogue between two approaches, that of science and philosophy, sincere progress can be made. In conclusion, the thesis ends with a provocation: much of our intimate experience is crowdsourced, and we are inescapably social.
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ABSTRACT

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“Human consciousness is just about the last surviving mystery. A mystery is a phenomenon that people don’t know how to think about — yet. There have been other great mysteries: the mystery of the origin of the universe, the mystery of life and reproduction, the mystery of the design to be found in nature, the mysteries of time, space, and gravity. These were not just areas of scientific ignorance, but of utter bafflement and wonder. We do not yet have the final answers to any of the questions of cosmology and particle physics, molecular genetics and evolutionary theory, but we do know how to think about them. The mysteries haven’t vanished, but they have been tamed. They no longer overwhelm our efforts to think about the phenomena, because now we know how to tell the misbegotten questions from the right questions, and even if we turn out to be dead wrong about some of the currently accepted answers, we know how to go about looking for better answers. With consciousness, however, we are still in a terrible muddle. Consciousness stands alone today as a topic that often leaves even the most sophisticated thinkers tongue-tied and confused. And, as with all the earlier mysteries, there are many who insist — and hope — that there will never be a demystification of consciousness.”

Daniel C. Dennett, Consciousness Explained (1991)
Consciousness is an enigma. The deep-seated feeling of being a conscious agent engaging with the world is unshakably familiar — above all else, we carry around an intimate sense that there is something it is like to be us. We organically navigate a world of choices and sensations, and yet, despite being seemingly self-evident, these experiences are also the most inaccessible to the outside observer. The qualities of our direct experience escape any measurable description; consciousness is, at once, both lucid and obscure. Paradoxically, the first-person privilege that allows for an awareness of our own conscious experiences is the very same privilege that blocks our access to other’s experiences.

Wherein lies the disconnect? Given the ease with which we naturally engage with and experience the world, one might expect that the contents of that experience would be outright transparent. However, this is simply not the case. In this very moment, for example, I can smell the aroma of freshly-brewed coffee. The scent has filled the room with a toasty and inviting warmth. But this account pales in comparison to the richness of the actual experience. The description of warmth and the feeling of warmth are fundamentally disparate concepts. By the same token, it may prove impossible to describe color to those who have been blind since birth; if you try to do so, you will find that the perception has an ineffable quality that evades any sort of concrete explanation. The private nature of these experiential qualities, or qualia, are beyond our ability to clearly communicate. No additional information about objective properties seems capable of overcoming this divide.

What is it about qualia that makes them so inaccessible? When mounting a search, it helps to know both what you are looking for and how best to go about locating that thing. After all, how else would you know when you had found it? For qualia, it appears we know neither.
The most direct approach seems to be through the neurosciences, but this approach soon meets the obstacle that observing brain activity and *experiencing* brain activity are not wholly congruent. At a basic level, brain activity is largely observable — driven by detectable, physical changes in electrochemical potentials within neurons — much like the actions of any other mechanical system. But observing this does not equal the experience that lies “within” that machine.

Imagine you were able to step into such a system and monitor its operation from within. You may witness these functions arising from mechanical causes (i.e., the firing of electrical signals and shunting of blood flow), more deserving of attention are the functions you are unable to see. Our thoughts and emotions certainly have a neural signature — they arise from some sort of brain activity — although the simple act of observing this activity seems to bring us no closer to the actual experience. All we ever see are the mechanical causes; the quality of the emotion, content of the thought, or richness of the percept are out of reach. This *explanatory gap* was first highlighted by Gottfried Leibniz, the German mathematician, and philosopher; bridging this gap has been a major obstacle to the scientific study of consciousness ever since.

Many other philosophers have called attention to this epistemic rift. One notably persuasive application was articulated by the philosopher Frank Jackson’s thought experiment: “Mary the Color Scientist”. Suppose, he argues, there lives a woman named Mary, who has spent her entire life studying the mechanisms of color perception. She has been incredibly successful, and knows all that can be known about the physical properties within the wide spectrum of colors; in detail, she can describe the interaction between different wavelengths of light and the optics of the eye, the neurophysiology underlying each percept, and even how the brain
processes that information. There is, however, one important caveat: she has never actually seen any colors at all. Mary, for her entire life, was raised in an isolated room completely devoid of color. If she were later able to escape that environment and step outside, what would her experience be? Would you expect her to gaze at the blue sky and unremarkably claim “of course that is blue”, or rather, exclaim, “Wow! I never imagined blue would look like that”?

Viscerally, some are drawn to the idea that this is in fact new information, a raw experience, that no amount of reading textbooks could have prepared her for. Notice however, that if her knowledge of color’s physical properties were truly complete, her conceptual understanding would be absolute. Even still, it seems she is able to gain the previously unknown information about the subjective experience of what color is like.

The merits of this common belief have since been challenged, though, despite the absence of any present consensus among philosophers, the thought experiment is powerful in its ability to cast light on the intuition that objective information alone paints an incomplete picture of the world. We must leave room for conscious experience.

A Hard Problem Indeed

“It is undeniable that some organisms are subjects of experience... It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises. Why should physical processing give rise to a rich inner life at all? It seems objectively unreasonable that it should, and yet it does.”

If the qualities of our experience exist in some fashion outside of the physical acts we directly observe, are they always necessary? In asserting that they are distinct and supplemental, one might reasonably ask whether they may be left out entirely. In other words, is it possible to conceive of a being in which their mental function remains intact, but thoroughly lacks any sort of subjective experience?

An early proponent of this line of inquiry was David Chalmers, who likewise wondered if what he termed a "Philosophical Zombie" was conceivable. These zombies supposedly bore an outward expression that was indistinguishable from their normal human counterparts; they could report on the experiences they were "having", their preferences, and desires. Beyond the surface, however, it was all a facade; there was no true consciousness, rather, just the product of cleverly programmed responses.

Chalmers concedes that this thought experiment may be implausible — we have no reason to believe that these zombies are among us — yet the very notion that this scenario appears conceivable suggests that subjective phenomenal properties may be separated from the outwardly visible psychological properties (e.g., expressions of thoughts and desires). Science as a whole has made significant strides towards understanding these psychological properties; our understanding of the biological and chemical processes which allow the brain to function has grown tremendously. There are certainly many questions left to answer, but these are "easy" relative to the challenge presented by the other aspect of our experience: the phenomenal properties. Providing a scientific account of the mind’s subjective contents are the real task worth pursuing, the Hard Problem of our time as Chalmers describes it.
The Roots of Consciousness

"Dualism makes the problem insoluble; materialism denies the existence of any phenomenon to study, and hence of any problem"


Matter and Soul

For centuries, philosophers and theologians alike have echoed the sentiment that mind and body are distinct; the suggestion of an afterlife implies that there is some part of you that transcends bodily death (i.e., an immortal soul). The roots of this idea can be traced to the works of the ancient Greek philosopher Plato, who in his *Phaedo*, posited the existence of the *Forms* — a sort of eternal substance which exists in some realm beyond the material world. Whereas physical objects may have imperfections, the Forms were perfect and absolute. The Forms were thought to be of a different substance, one in which concepts of shape, size, and quantity do not apply. Since the Forms were supposedly immaterial, and the intellect was thought to gain knowledge through comprehension of these forms, Plato argued that the two may have an intimate connection which unites them after death.¹

Plato’s account is the first to delineate the world into two distinct types of things: physical substances (e.g., material objects) and mental substances (e.g., Forms). This theory, which developed into what is known as *substance dualism*, was widely influential. Of the later contemporaries who would come to be associated with this view, few were as prominent as the French mathematician and philosopher, René Descartes.

¹ This assertion of the relationship between intellect and soul originated from a three-part series of arguments designed to prove the soul’s immortality written in the *Phaedo* (Lorenz, 2009).
Like Plato, Descartes thought the world was composed of two substances: matter and mind (Hatfield, 2016). The familiar objects of our experience (e.g., trees, books, animals) are composed of matter, or *res extensa*. In contrast, mind, *res cogitans*, is the essential property which thinks and unites our experience; the part responsible for the feeling that there is a “you” somewhere in the body — allegedly located within pineal gland. It is this latter substance which makes humans unique.

**The Mind is Matter**

The central issue at the heart of substance dualism is explaining how these two incompatible substances interact. As conscious beings we feel agency over our choices; the explanation offered by Descartes is that somehow the mind has the power and authority to cause changes in matter. When pressed for the details of how this interaction takes place, he offers little more than obscurities. The intricacies of this question are deeply problematic for the dualist.

Take, for example, a game of billiards. Obviously, two material objects can interact — the cue striking a ball, or balls impacting each other — but how could this movement, the outcome of a physical collision, be caused in the absence of a material force? Even the less visible forces, like gravity, amount to the attraction and repulsion of matter at the atomic scale. Descartes and other substance dualists, are faced with the challenge of explaining how it is that matter and mind, two irreconcilable substances, can somehow influence each other. This well known objection has been called the *Mind-Body Problem*.

Absent any spooky, supernatural phenomenon, the Mind-Body Problem appears impossible to circumvent, and may perhaps be fatal to the theory of substance dualism. This criticism isn’t limited to substance dualists alone, however; any theory which posits some
immaterial substance or force alongside the material must explain how it is the two interface. Some contemporary theorists seem to have found a solution to the Mind-Body Problem: deny there is a problem altogether.

The materialist camp challenges the fundamental dualist notion that there exists more than matter in the world. Instead, they propose something akin to: “what you see is all there is”. After all, if you can explain the interaction without appealing to otherworldly mystical forces, why leave room for them? The feeling that there really is something more, an immaterial self apart from the body, amounts to little more than a trick, an illusion the brain plays on itself (Baggini, 2011). This mental trick certainly is a persuasive one, but you need not abandon conscious experience when you side with the materialists.

Matter may be all that exists, though its presence alone does not generate consciousness; a heap of cells and tissues don’t make a person for the same reason that you cannot drive to Tucson with only the parts of a car engine. What really matters is how the parts are arranged, what function they are able to perform together. Most modern materialists are in fact functionalists — asserting that once you have explained the various functions the mind is able to perform, you will have also explained consciousness itself.

By this account, our conscious experience is entirely the result of the complex interaction taking place between the nearly 100 billion neurons within the brain. This view doesn’t deny there remains a great deal of mystery about the mind, though it asserts that these questions are, in principle, knowable; the mystery is not a supernatural one, but rather one that asks us to marvel at the remarkable intricacy of the system.
An exemplary functionalist, Daniel Dennett, garnered his fame by laying a foundation through which we may begin to scientifically think about consciousness in this fashion. In his seminal book “Consciousness Explained” he proposed the Multiple Drafts Model (2001). This novel framework challenged the notion of a singular location where consciousness “comes together”, often denounced as the Cartesian Theater, and instead suggested that there are many possible experiences being assembled in parallel. The ongoing processing of inputs and outputs is analogous to constructing many possible drafts to a story. When one of the drafts is “published”, or allowed to generate an action, then the story, the experience, is made concrete.

Functionalist theories may do a better job of ushering the pseudoscience out of the picture, but at what cost? This lens, while successful in filtering out superstitious ideas, also reduced consciousness to something far more lackluster; by Dennett’s account, qualia did not pose much of an interesting challenge at all — since qualia, as described by his critics, does not actually exist. (Dennett, 2002). Dennett’s view is essential this: the grandiose, unsupportable claims about the contents of our experience should be treated as such, only after abandoning our misguided intuitions about consciousness can our understanding really gain traction.

Many of Dennett’s critics felt that rather than explaining the tough questions at the heart of the debate around consciousness, he instead explained them away. Nonetheless, our experience feels like an authentic one — the things we see, touch, and hear, all seem to report to some single entity, a mind, trapped within the confines of the skull. What if, however, that “trap” was not much of a trap at all?
Boundaries of the Mind

Our sense of self appears to extend throughout our body — we recognize the legs which help us to navigate as our own, not some independent entity that could “run off” in disagreement. Why then, do our intuitions lead us to view the brain as uniquely the source of our identity? Are we wholly misguided to think that the mind could be found in a single, discrete location? Could this artificial boundary drawn around consciousness, the bone envelope, be an arbitrary one?

Here, the most basic of questions also proves to be one of the most challenging; where exactly is the mind? The possible responses to this issue markedly delineate the two distinct ways of conceptualizing the mind: should we think of our consciousness as being situated (i.e., located in a particular space) or distributed (i.e., delocalized in some sense). For those arguing the latter, the separation between mind, body, and environment is an unprincipled distinction (Clark & Chalmers, 1998).

At first pass erasing these divisions may appear unintuitive. One notable proponent of this view, Andy Clark, has proposed the following thought experiment to bring our natural inclinations to light. Suppose that two people, Otto and Inga, are traveling to a museum at the same time. Unlike Inga, Otto has Alzheimer’s disease, and must therefore record the directions in a notebook. Whereas Inga “reaches into” the contents of her brain for the directions, Otto reaches into his notebook; the only meaningful difference being that Inga’s memory is processed internally, whereas Otto’s is externalized.

Should Otto’s notebook be constantly and immediately accessible to him, it would appear to be functioning in an equivalent way to Inga’s memory. Consequently, in treating Otto and
Inga’s employment of memory as truly analogous, it follows that the boundaries of mind may reasonable extend outward into the environment.

Other philosophers have gone even further with this line of reasoning. In the book “Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness”, Alva Noë contends that the mind may not have any spatial location at all (2010). Historically, the problem has been the assumption that consciousness is some sort of process — like digestion. Instead, he suggests that we conceive of consciousness as an activity — like dancing.

In order to dance you need to be capable of some sort of motion. As humans, we have an intricate musculature capable of all sorts of complex movement. Muscles in isolation, however, don’t dance; dance is an activity, an engagement with the surrounding space. For this reason, it wouldn’t be right to say that a dance is to be found within the body. In similar fashion, the brain may have an indispensable role in producing conscious experience, but that does not necessitate it as the location of that experience. Rather than search within the brain for experience, we should turn our attention outward, focusing instead on the ways in which we dynamically engage with the environment around us.

The Neurobiological Study of Consciousness

“The Astonishing Hypothesis is that ‘You’, your joys and your sorrows, your memories and your ambitions, your sense of identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules...”

Francis Crick, The Astonishing Hypothesis (1994)
Providing an empirical account of consciousness remains one of the great challenges of our time — the qualities of our experience seem inextricably outside the grasp of objective inquiry. For this reason, much of the contemporary research on consciousness addresses the Hard Problem only tangentially. Even still, the study of the mind has been far from a fruitless endeavor; cognitive scientists, neuropsychologists, and the like, have made tremendous headway in investigating a constellation of related concepts (e.g., free will, artificial intelligence).

The more we are able to understand how these individual functions operate at the most basic level, the better the whole comes into focus. In this way, the mind is like a photomosaic — though it is composed of hundreds, or thousands, of discrete parts, sometimes you can only make sense of the big picture by seeing the relation between the parts. In many cases, these relationships are best illustrated by examining individuals whose experience is atypical.

**Damage, Disorders, and Deficits**

At the onset, studying subjective experience proves problematic because it is not clear in what method it should actually be undertaken. Self-reporting appears most direct, though in many interesting cases, one’s perceptions and experiences can be radically misaligned. Take, for example, the fascinating condition of blindsight.

Sometimes manifesting following a localized lesion or stroke within the primary visual cortex (V1), an individual with blindsight has seemingly disconnected visual awareness from visual attention. Patients may self-report having either partial or total blindness, while simultaneously responding to visual stimuli; in one case study, a man with blindsight was able to easily navigate a hallway, which unbeknownst to him, was staged with obstacles — even
pressing up against a wall to squeeze by a trash can — while maintaining no conscious awareness of an ability to see his environment (de Gelder, 2008).

Blindsight illustrates how attending to a stimulus, and being conscious of that stimulus, are not entirely synonymous. For any fan of magic this notion is far from controversial — we are often the subject of optical illusions, mental shortcuts, or subconscious priming, all of which take advantage of this discrepancy.

In other cases, the problem is not a false-report, but rather, the inability to report entirely. Conscious experience exists on a gradient: ranging from those able to meaningfully engage with their environment, to others left in a persistent vegetative state (PVS) who exhibit no external signs of mental life. Among the most troubling are the minds trapped in a nightmarish limbo between life and death — those with locked-in syndrome. Patients who have locked-in syndrome typically have no loss of cognitive function, remaining fully conscious and aware, however they cannot express their thoughts due to a complete paralysis of nearly all muscles of their body. For many, the intactness of mind is an insufferable sort of torture, though a few patients have been able to find a surprising degree of purpose; in one remarkable instance, Jean-Dominique Bauby, who suffered from locked-in syndrome following a massive stroke, authored a memoir chronicling his experience solely by blinking.

For those unable to report on the contents of their experience, functional brain scanning (e.g., fMRI, EEG, PET) provides a glimpse into the mind’s activities. With methodological advances over the last decade, a prospective line of communication appears to have been opened. Previously, if patients bore no outward indication of awareness, they were naturally thought to lack any semblance of consciousness. Recent research from the lab of Adrian Owen, author of
"Into the Gray Zone: A Neuroscientist Explores the Border Between Life and Death", gained tremendous attention when this presumption was demonstrably shown to be false. In a now famous study published in *Science*, Owen took fMRI scans of a vegetative patient who was instructed to “imagine playing tennis” and the result was astonishing: the patient consistently showed activation in areas of the motor cortex that was homologous to the sort of activation seen in healthy volunteers (Owen et al., 2007). Using this method, other researchers have been able to replicate the findings with other comatose patients (Monti et al. 2010).

Nevertheless, observing activity is a far cry from observing experience. The degree of consciousness among patients in coma, PVS, or while under anesthesia, is a very lively, ongoing debate within medical ethics.

It is worth noting that these disturbances do not necessarily imply a deficit of some sort. In many cases, these changes may instead be the consequence of something gained, rather than lost. Exogenous psychotropic drugs (e.g., mescaline, psilocybin) have been used throughout history in medicinal and spiritual purposes because of the profound alterations in consciousness that they produce; effects range from euphoria and relaxation to intense visual hallucinations and feelings of dissociation.

For others, no psychoactive drugs are needed — the same sort of mysterious disturbances may arise organically within the brain. There is perhaps no better illustration of this phenomenon than *synesthesia*. Individuals with synesthesia, known as *synesthetes*, have a radically different sensory experience than others. In normal individuals, activation of the auditory pathway would produce sound. In a synesthete, however, perceptions are often multimodal: the sound of C-sharp may accompany the sight of a blue streak, a feeling of elation, or even the taste of strawberries.
Little is actually known about the etiology of synesthesia, but it is thought to be the result of an interplay between sensory pathways that are typically discrete. This sensory mixing happens in a manner unique to each synesthete; many enchanting examples are detailed in the iconic book “Wednesday is Indigo Blue” written by Richard Cytowic and David Eagleman, both of which are neuroscientists who have done pioneering research in the area (2009).

When the normal biological operations of the mind are disrupted, whether by something lost or something gained, so too are the contents and quality of one’s experience. The interface between brain, mind, and self is an intimate one — by affecting the brain, the substrate upon which the mind so deeply depends, changes emerge throughout the system. Once the structure of thought and experience has been altered, dramatic modification to identity follow.

One of the most well-known illustrations of this phenomenon comes from records dating back into the 1800’s, concerning the infamous story of Phineas Gage. Having worked many years as a foreman helping to blast rock in preparation for laying new railroads, his job was to use a large iron rod to tamp down inert sand into holes filled with blasting powder. While his attention was directed elsewhere, he struck a blast hole filled solely with explosives, launching the iron rod up through his left cheekbone and out through the crown of his skull. To everyone’s surprise, he not only survived the traumatic incident, but was also able to walk with little assistance to a nearby physician.

Gage’s survival after such significant damage to the brain is remarkable by itself. Miraculously, his mental function remained intact following the damage to his brain. The story was made famous, however, by the changes to his temperament which followed soon thereafter. Prior to the injury, he was well-regarded as a responsible, hard-working man. What remained
was someone entirely different, a vulgar and profane man, recognizable only by appearance —
so changed was he, that his friends said he was no longer Gage.

The extent to which Gage’s personality changed is hard to quantify given that the
observations were taken so long ago. Research into the connection between mind and self has
only deepened in the many decades which have followed, and some contemporary investigators
have brought even more profound mysteries to light. One such investigator is Michael
Gazzaniga, perhaps most well-known for his pioneering work with split-brain patients.

In a typical individual, the brain has two distinct halves, the cerebral hemispheres,
divided at the midline. Though mental functions frequently require a network of activation across
the brain, in some cases, particular operations are lateralized — designated exclusively to one of
the hemispheres; the capacity to produce speech and understand language, for example, are
functions processed within regions only found in the left-hemisphere of most individuals. The
interface between the hemispheres is a bundle of commissural fibers, a neural-bridge, known as
the corpus collosum. Most often, the two hemispheres work in synchrony. However, should this
relationship become a toxic one, the lines of communication are broken off.

Severing the corpus collosum may serve as the last-resort intervention for those with
intractable epilepsy — a malignant pattern of abnormal brain activity that is unresponsive to
other forms of treatment. Through a surgical procedure the aberrant hemisphere is isolated,
preventing the transmission of signals that would otherwise run rampant and wreak havoc
throughout the brain.

Though plastic and able to adapt to damage, the brain cannot fully recover from such a
surgery. Once severed, the two hemispheres will have forever closed-off any direct means of
communication, each continuing to operate independently of the other. The outcome is an interesting one: leaving not one, but two minds, each with their own unique thoughts, interests, and preferences.

Two minds housed within one body? The notion is so strikingly foreign that reconciling the idea with our own experience is exceptionally challenging. The discovery of this phenomenon was the product of ingenuity at the hand of researchers, like Gazzaniga, who found a means of exploiting the unique manner in which the brain is wired.

Absent any damage, the eyes acquire information from both the left and right visual fields. They then transmit those signals to the brain where a single, synthesized image is resolved. But due to a “crossing-over” of nerves at the optic chiasm, the left hemisphere receives information from the right visual field, while the right hemisphere processes information from the left visual field. Much of the brain operates in this contralateral fashion — the left brain controls the right side, and the right brain has dominion over the left. For most individuals, this presents no issue; if one hemisphere “sees” something the other does not, it communicates that information across the corpus collosum. For split-brain patients however, it is not so straightforward.

Only the left hemisphere is verbal (i.e., able to articulate speech and understand language). When interacting with a split-brain patient, the dialogue is with their left brain; the right brain resides as a mute observer. Experimentally, researchers discovered that if you quickly present a stimulus to the left visual field — processed by the right brain alone — then the left brain will report not having seen anything (Gazzaniga, 2011). Though the right brain is unable to
speak, if you give it the opportunity to act, for example by pointing with the left hand, which it
controls, then the object can still be identified.

This presents an interesting dilemma: on one hand, patients are able to physically identify
whatever object was presented, yet they verbally report not having seen anything at all. How are
these two incongruous behaviors resolved? When faced with a discrepancy of this sort, the left
brain, spares itself from any discomfort with a creative solution: tell a lie. What is most
fascinating is that it does not even realize it is lying — instead, while desperately trying to make
sense of the experience, the brain confabulates a fictional story to account for the action.

Since only the left hemisphere is able to tell these stories, to construct the narrative, it
was coined "the interpreter" by Gazzaniga. The result is an asymmetrical relationship with its
silent partner, the right hemisphere, who learns only of the story once it has been articulated by
its overseer.

Though disturbances of consciousness offer a fascinating way to study the ways which
the mind can be altered and influenced, they stop short of yielding a holistic understanding; after
all, these sorts of conditions are rare medical oddities, a notable departure from most everyone
else’s typical experience. Other lines of research have chosen to focus less on the anomalies and
more on the norm — seeking to provide an answer for why conscious experience exists in the
first place.

Contemporary Theories of Consciousness

"Within psychology and neuroscience, some new and rigorous experimental
paradigms for studying consciousness have helped it begin to overcome the
stigma that has been attached to the topic for most of this century."
Consciousness is a Social Narrative

Though many functions are shared with other mammals, humans have a uniquely well-developed ability to communicate. The capacity for language and communication certainly is not exclusive to homo sapiens, these abilities developed far earlier in our shared evolutionary history, though our faculties far exceed what other organisms appear capable of.

Not all communication is verbal; in fact, the actual words spoken compose only a minor fraction of what is conveyed. Subtle differences in tone, direction of eye gaze, gestures, and body-language all influence how a message is perceived. Our innate knack for understanding these various components has proven extremely advantageous — being able to quickly, and accurately, distinguish a friend offering aid from an enemy threatening survival may mean the difference between life and death.

Communication is often nuanced. Consequently, large swaths of our brain are dedicated exclusively to this sort of social-cognitive perception, giving rise to specialized areas which help to make sense of the complex, multimodal information. One such region is the temporo-parietal junction (TPJ) — an area of the brain located near the uppermost portion of the ear. The TPJ tends to light up during all sorts of social perception, though is most associated with processing that involves Theory of Mind (ToM).

Few aspects of social interaction are as essential as the ability to understand the desires and intentions of others. Given our biological constraints, we cannot simply step-into another’s mind — though, we can run simulations of it. Each time we try to assume a different person’s
viewpoint, we are making informed guesses about the contents of their experience, constructing a theory of their mind.

Some theorists have suggested that this ability to understand the minds of others eventually turned inwards. In other words, humans developed consciousness, a sort of self-awareness, once able to ascribe that same awareness to others. Research in social-cognitive neuroscience appears to support this developmental handover; studies consistently indicate that the TPJ is activated both when attributing mental states to others and when attributing mental states to oneself (Carrington & Bailey, 2009).

While the exact mechanistic explanation may differ between social theories, most view consciousness as an effect of being able to interpret our own behavior. Absent this ability to provide an explanation, our actions would become confused and random, seemingly without purpose. It is through consciousness that a coherent narrative throughout life is forged, one that unites separate events into a single continuous experience.

As a whole, social theories provide a good account for the presence of self-knowledge. Critics, however, are quick to point out that self-awareness is not identical to awareness of external events. For example, the brain may construct a narrative to explain why it avoids foul smells (e.g., rotten things are bad), which demonstrates a certain degree of self-awareness, while at the same time offering no account for the actual phenomenal experience; in other words, social theories provide an explanation for the effects of consciousness, but not the experience itself.

Consciousness is Integrated Information

The brain may be the most elaborate system in the known universe; with an estimated 86 billion neurons, each synapsing with potentially up to 10,000 other neurons, the network is
remarkably intricate (Azevedo et al., 2009). This complex biological assembly may have
developed to meet the needs of the equally massive degree of information that it processes. In the
same way that sounds from different instruments fuse together in an orchestral arrangement, the
brain unites entirely distinct sources of stimuli (e.g., electrochemical signals, photons of light,
mechanical pressure from sound waves) into a synthesized product. Underlying every action,
each thought or feeling, lies an around-the-clock computer which gives rise to a marvelous
biological symphony: our experience.

Brains function, at least in some respects, analogously to how a computer operates:
information is received from some source, it is broken down into the simplest form for
processing, and the product is broadcast in some fashion. All our mental functions appear to
follow this template, though we often pay the actual computations little attention — usually
taking place “under the hood”, outside of our conscious awareness.

As the computations performed take on additional layers of complexity, so too may the
results. Take for example, how an image is constructed. At the most rudimentary level, details
about the orientation of lines are encoded corresponding to the presence of edges and outlines.
Changes in the line’s position within the visual field indicate some degree of movement. Familiar
shapes and objects are recognized, and the constellation of related constructs within memory
guide the perception of other forms. Contrast between textures is quantified, and the qualities of
color are layered onto the image proportional to combinations of particular wavelengths of light.
All these steps are processed in parallel and without expending any degree of conscious effort.

The field of neuroscience has laid the framework by which we may come to understand
exactly how our brains accomplish feats of this sort. Tremendous progress has been made on this
front; there exists now at least a basic mechanical understanding of many of the functions we are able to perform. Given that this computational perspective has been so instructive, some have proposed that it may similarly provide an account of the mind’s most enigmatic function: consciousness.

In 2004, Giulio Tononi proposed his Integrated Information Theory (IIT), and it has since been recognized by notable researcher Christof Koch as “the only really promising fundamental theory of consciousness”. Tononi’s account treats consciousness like any other mental function, albeit an incredibly complex one, positing that it manifests from the complex integration of information in the brain. To supplement his theory, he formalized a means of mathematically quantifying the degree of informational integration using a value denoted as $\phi$.

Functional brain scanning while under anesthesia seems to lend some independent support for IIT; the loss of conscious awareness correlates with a corresponding decrease in global activation of neural networks within the brain. While IIT appears to present a simple, straight-forward way of thinking about consciousness, the underlying math which substantiates the theory is far less clear. Part of the challenge for the theory has been finding an objective way to measure $\phi$; as it stands, $\phi$ appears more like a theoretical construct than a tool for actual applied analysis.

Further, not all information is equally valuable. Through the senses, the brain collects a astronomical amount of data and must filter through it to find what is meaningful — only a small fraction of what is kept even makes it into conscious awareness, the rest is delegated to the subconscious. Despite being inaccessible directly, the contents of our subconscious also undergo a great deal of processing and inform the conscious decisions we make.
If complex bits of information are processed and integrated at the unconscious level, why does consciousness not result? Computers of all sorts integrate information, some at a scale far greater than what is possible for humans — even the internet, perhaps the most massive source of integrated information, fails to show even the slightest sign of being endowed with a conscious experience. Proponents of IIT would likely respond that global integration of information is necessary for consciousness, though not sufficient since the type of information also matters deeply. From here, the challenge only deepens: explaining exactly what special qualities the information must have demands some understanding of the physical correlates of consciousness, which thus far have not been discovered.

**Consciousness is the Attention Schema**

Novel work by the neuroscientist and philosopher Michael S. A. Graziano has given rise to a new hypothesis, *The Attention Schema Theory* (AST) which appears to unite the positive elements from other contemporary theories while also avoiding their respective weaknesses. Graziano’s new book, “*Consciousness and the Social Brain*” details the nuances of the theory at length.

At the heart of AST is the idea that the brain constructs constructs schemas, an informational model, to organize this data. Schemas of all sorts may be used to integrate information; one of the familiar illustration of this modeling is the concept of *body schema*. In each moment, the brain maintains an internal model of the body’s position in space — arising from the integration of proprioceptive information from the limbs. Accessing this schema helps to coordinate and plan motion. When focus is directed outward toward an object, an apple for
example, an informational representation of that apple is constructed (e.g., shape, location, color).

Within other theories, the term consciousness is often used interchangeably with attention, awareness, and experience. For AST, however, these semantic differences matter a great deal because they concern discrete phenomena. Graziano prefers a neuroscientist’s interpretation of the term attention (i.e., a method of managing data). The brain has the ability to exercise some control over how it allocates its resources; choosing to attend to the violinists within a symphony orchestra entails the boosting of particular signals and the dampening of others.

Graziano’s novel contribution is the idea that attention itself is similarly modeled in this way. The attention schema is thus an information model of the act of attending to something. In the same way that attention is constantly changing, so too is schema responsible for monitoring these changes. within the attentional schema, and reporting on the current state of its focus.

This cognitive framework stems largely from the manner in which the brain manages the “problem of other minds” — the notion that we are immersed in a social context where we engage with other minds, and yet have no clear way to “step-into” their experience and really understand their inner mental life. Though we do not have direct access, knowing what others around you are thinking poses a strong evolutionary benefit; the ability to predict another’s intentions and desires can make the difference between life and death. Humans seem to navigate this problem intuitively by using theory of mind, which allows us to make informed guesses based on what information is available (e.g., body language, context). In this way, the “black box” becomes accessible by constructing a schema of their mind.
The most controversial claim that Graziano makes is that this awareness, the model of attention, is synonymous with consciousness. Whereas others point to the ineffable qualia which seem to underlie subjectivity, Graziano, in line with Dennett (2017), argues that we don’t experience qualia in the way that we believe we do. In fact, the idea of experience itself is rather a sort of “user-illusion” wherein there really is no true subjective perspective. In other words, we have the same access problem with our own minds, and thus, what we think we know about ourselves, and our experience, is really the result of an attribution generated from an abstract informational model.

**Crowdsourcing Consciousness**

"You only exist as a pattern made up of all the other things in your life that shape you. If you take each away, ‘you’ would eventually cease to exist. This does not mean that you do not exist at all, but rather that you exist as a combination of all others who complete your sense of self."

*Bruce Hood (2012)*

The Attention Schema Theory offers an useful paradigm for thinking about the mind and experience. By deflating the way in which think about consciousness, Graziano and many of the other modern physicalists, make the Hard Problem tractable — by claiming there really is not a problem at all. However, this approach is certainly contentious and divisive. The real problem, it appears, is deciding how to navigate an epistemic dead-end. Are we correct in holding on to our belief in qualia, the ineffable, but apparent, aspect of our experience? Or, should we rather find a creative escape from the problem, which involves some degree of mental gymnastics, to impart a theory which is constructive though counter-intuitive?
Perhaps we are too quick to conflate counter-intuitive with misguided. Throughout history, many of the ideas which challenged the status-quo of the time proved later to be most influential. The history of thought is punctuated by radical thinkers — consider the framework proposed by Charles Darwin, whose Theory of Evolution by Natural Selection was a direct contradiction of the universal understanding of much of the previous interpretation underlying the biological sciences (1859). It took many years of criticism before Darwin’s theory began to resonate with others in the field, but it has forever changed the direction of biology since. It is possible the same sort of frameshift will transpire from the controversial ideas proposed by Dennett and Graziano, though only time will tell.

Thinking about consciousness through the lens of Graziano’s theory does nevertheless enact change in the present. His ideas are inescapably social in nature, and adopting them has a direct influence on the nature of our relationships with others. The manner in which we think about others is colored by collective social phenomena — we infer what others may be like based on our history of past experiences in a shared social environment. Through socialization, through culture, and through relationships, we learn what others are like. In the same way, you come to learn yourself. By recognizing the ways in which our experience of the world is shared, rather than private, an emphasis is placed on interconnectedness and mutual dependence on others. In sum, you, and I, and all others, are crowdsourced.
BIBLIOGRAPHY


REFLECTIONS

In sum, my capstone project was an exploration of the questions surrounding conscious experience. When I first became involved in philosophy, the constellation of questions about the mind are what most resonated with me. During my time as an undergraduate, I was fortunate to have a broad education in both the humanities and science. This approach I had always seen as valuable — the ability to approach a challenging topic from multiple avenues made it more accessible, and allowed me to better appreciate how intricate some questions could be.

While researching and writing my capstone project, I sought the same interdisciplinary approach. This proved to be a worthwhile approach — philosophers, psychologists, and neuroscientists alike have all independently sought to understand consciousness through their respective fields, and thus, a rich body of research and literature was readily available. My goal with this project was to familiarize myself with these ideas, and highlight a sort of consilience, wherein many of the ideas and theories overlapped in constructive ways.

I chose to research consciousness, rather than say free will or artificial intelligence, largely because of the magnitude of the problem and implications in medicine. Until somewhat recently, the study of consciousness was considered to be a fringe topic in the sciences — perhaps because of the manner in which it naturally attracts quack ideas and pseudoscience (e.g., we will things into existence by directing quantum energy coherence), but despite meaningful progress, still remains on the periphery of what is acceptable. Fortunately, the study of consciousness is working to dispel some grandiose ideas in favor of scientific reductionism, offering serious promise for advancing the understanding areas like anesthesiology. Given that
my intent is to pursue medicine, studying this problem in particular was a way to unite my interests with an area of research that is both growing rapidly and gaining popularity.

Prior to beginning this capstone project, I had been fortunate to work for years as a research assistant in the Multisensory Cognition Lab on campus. This background proved invaluable; it armed me with a familiarity with the research process and how to best go about finding useful information, but even more importantly, I developed a scientific lens through which I would evaluate ideas. During my Junior year I applied for, and was awarded, a URCO grant to conduct my own research project; for the study, I investigated Theory of Mind, the ability to think about what another’s are thinking, using electroencephalography (EEG).

Researching Theory of Mind from the perspective of social-cognitive neuroscience proved to be more philosophically engaging than I would have expected. Consider the “problem of other minds”: we have no direct access to the minds of others, we are familiar only with our own experience, so would it ever be possible to prove objectively that another person is conscious? The inner mental life of others is a closed-off black box, so the brain constructs a “theory of mind” to establish a best guess about what another may be thinking, what they may desire, or how they will behave.

Within the sciences, the approach is to often tackle a microcosmic question — and for good reason, as one becomes more “big-picture” the claims made often end up more speculation than science. However, I felt the two approaches could be more synergistic than antagonistic, so I resolved to explore the way in which my research in neuroscience may interface with questions about consciousness. Soon thereafter, I stumbled across a book written by Michael Graziano, *Consciousness and the Social Brain*, wherein he argued that consciousness is really an attribution
based on limited evidence (i.e., theory of mind) and that absent a social environment, we would not have developed this subjective perspective. After speaking with Dr. Charlie Huenemann, we decided this would be an interesting question to research further for my capstone.

When first beginning my capstone, I hadn’t yet developed a concrete theory or thesis statement. At most, I had a vague interest in the ideas presented in Graziano’s book. Without any clear direction in mind, the initial research proved challenging; Dr. Huenemann and I were able to identify plenty of interesting books and articles, and although reading through them all was certainly worthwhile, it was not always clear what sort of connection I should be looking for, so it was tough to gauge my progress.

Whereas I had initially set out to explore this one particular question — how theory of mind and consciousness may be intimately interconnected — I instead dedicated only a small section to that topic in my actual capstone. In outlining my ideas, I wrote a brief history of the main theories and problems with the study of consciousness throughout time; as it turned out, I enjoyed this much more than focusing in on just one aspect of the question. Consequently, I resolved to broaden my focus, choosing instead to write about consciousness generally.

The end product was a synthesis of my undergraduate career. I gained an appreciation for the overlap between the many fields in which I was interested in, and synthesize them into a concise theory which I had long sought. In early April, I was able to present this theory during a 20-minute talk at The Science of Consciousness, an interdisciplinary research conference held each year. After my presentation, I received very positive feedback and constructive ideas about future directions. Finally, I was able to network with medical school faculty, most notably the director of the Center for Consciousness Science at the University of Michigan Medical School.
AUTHOR BIOGRAPHY

Justin Campbell is a senior undergraduate student at Utah State University. Though he is majoring in psychology and philosophy, his interests span much broader territory. Over the last four years, he has been actively conducting research — both in the field of social-cognitive neuroscience with the Multisensory Cognition Lab, and in philosophy of mind with his thesis mentor Dr. Charlie Huenemann.

Two years ago, he was awarded an URCO grant which gave him the funding to develop and conduct a study of his own design. For this project, Justin used electroencephalography (EEG) to investigate the neural signature of Theory of Mind — the ability to think about what other’s may be thinking in challenging social dilemmas.

While engaging in undergraduate research, he has had the opportunity to present his work as first author at multiple academic conferences throughout the country (e.g., the Cognitive Neuroscience Society, the Science of Consciousness). For his meaningful involvement, Justin was recognized as the 2018 Psychology Department Undergraduate Researcher of the Year, the Emma Eccles Jones College of Education and Human Services Undergraduate Researcher of the Year, the Philosophy Student of the Year.

Upon graduation, he plans to synthesize his passions for research, the mind, and medicine, by applying for MD/Ph.D. dual-degree programs in cognitive neuroscience. On this path, he wishes to continue researching the enigma of consciousness, and desires to later work as a neurosurgeon.