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# Overview of Consciousness Research

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*The purpose of this paper is to orient the reader to the contemporary scientific study of consciousness. One of the most noticeable features of research concerning consciousness is that there are three domains of discourse, the physiological, computational and experiential, each with its own methodology and concerns. While confusion is often expressed about what it is that one is discussing, there are four main categories of definitions of the term consciousness: consciousness<sub>1</sub> is the registration, processing and acting on information; behavioural consciousness is the explicit knowledge of one's situation, mental states or actions as demonstrated by one's behaviour; subjective consciousness is the subjective stream of thoughts, feelings and sensations that occur for a person; and consciousness is the sense of existence of the subject of mental acts. There are also disparate views concerning consciousness that surveys have revealed to be correlated with investigators' beliefs about the nature of reality along a material-transcendent dimension. Those with materialist views tend to think that only that which is physical is real and that consciousness is an emergent property of neural or information-processing systems; those with conservatively transcendent views think that there is more to reality than that which is physical and emphasize subjective aspects of consciousness; while the extraordinarily transcendent conceptualize consciousness as ontologically primitive and place importance on self-transformation. An investigator's contention that she has had anomalous experiences appears to incline her toward a transcendent position. The presence of these correlations indicates that research programs concerning consciousness proceed, not in an unbiased manner, but on the basis of personal beliefs about the nature of reality. Can beliefs change in the course of the educational process? Data from 129 undergraduate students indicates that beliefs about consciousness and reality can move in a transcendent direction in classes with an instructor with extraordinarily transcendent beliefs.*

## 1 Introduction

There has recently been a great deal of interest concerning consciousness within the academic community, yet the research effort has been fragmented with many academics working at cross-purposes to one another. What is presented here is an overview of the contemporary study of consciousness that can serve to provide a context for discussions concerning consciousness. This consists of a delineation of three domains of discourse, metanalysis of definitions of consciousness, a discussion of the beliefs about consciousness and reality of consciousness researchers and the results of a study concerning changes in students' beliefs that has implications for consciousness research.

## 2 Domains of Discourse

One of the most noticeable features of research concerning consciousness is that there are three domains of discourse that often have little to do with one another. One domain of discourse, the physiological, is concerned with an understanding of the biological processes involved in consciousness. This is the realm of neuroscience and the usual methods of biology and

observation of behaviour are used in order to gather knowledge concerning consciousness. Somewhat disconnected from neuroscience, although often considered part of the physiological domain, are discussions of the relationship between subatomic events and consciousness. This includes discussions of relationships between quantum mechanics and mind.

A second domain of discourse is the computational whereby consciousness is discussed in terms of information processing. This is the area of cognitive science which subsumes primarily the disciplines of cognitive psychology and philosophy of mind. In practice, it is concerned with cognitive processes such as thinking, language, memory, problem solving, and creativity. One of two theoretical presuppositions is made, namely, that mind results from processes analogous to those used by computers or that it results from the parallel distributed processing of networks of connected units. Knowledge is derived from the observation of behaviour, including verbal behaviour, and from theoretical analyses.

A third domain of discourse is the experiential involving phenomenological, humanistic and transpersonal approaches to consciousness. This includes discussion of both subjective and private features of consciousness. Knowledge is derived from introspection as well as from the accounts of others concerning their experiences.

The first thing to note about these domains of discourse is that they are domains of discourse, not necessarily of phenomena. For example, ingestion of a psychedelic substance is a physiological event that has specific neural effects, such as the stimulation of S<sub>2</sub> receptor sites (Levinthal 1996), yet has perceptual and cognitive as well as experiential effects some of which can be profound and persist for years as in the case of seminary students given psilocybin prior to a Good Friday service (Doblin 1991). The second thing to note is the lack of any widely accepted links between these domains of discourse. In fact, there has been considerable attention drawn to the presence of the explanatory gaps between these domains with much debate concerning the inability to account for experience in physiological and computational terms. The third thing to note is that, while both bodies and experiences seem to be eminently accessible to an individual, the “middle” layer, the computational, may not exist except as a theoretical construct. “Mentalese”, the purported formal language of the brain, along with the necessary axioms and rules of classical logic necessary for the processing of information in a manner analogous to that in a computer, has been called into question (Barwise 1986). And whereas parallel distributed processing models arose from neural networks through a process of abstraction, they have become so far removed from the actual biological processes they initially represented that what it is about the brain of which these are models remains to be seen (Hanson & Burr 1990, Smolensky 1988).

### 3 Definitions of Consciousness

What are we talking about when we talk about consciousness? There are four main categories of referents for the term consciousness as described in Barušs (Barušs 1987, 1990, 1992). At the most basic level, consciousness<sub>1</sub> is the characteristic of an organism in a running state that entails the registration, processing and acting on information as demonstrated by the organism’s behaviour. Rather than getting into a debate about a minimum level of processing, consciousness<sub>1</sub> can be considered to be a variable. Similarly, rather than placing restrictions on the types of organisms that would qualify, such as larger mammals and humans, one can apply the term to any entity that meets these criteria keeping in mind that the manner in which they are instantiated may differ. That is to say, there is no reason to disqualify computers. It is important to note, with this and some of the other definitions of consciousness, that, in spite of some overlap, the concept of consciousness is not equivalent to that of awareness. In particular, whereas awareness is a passive property of an organism, consciousness has connotations of active agency as

reflected in discussions concerning free will within consciousness studies.

Behavioural consciousness<sub>2</sub> designates the use of the term consciousness to refer to the explicit knowledge of one’s situation, mental states or actions as opposed to lack of such awareness as demonstrated through one’s behaviour. Subjective consciousness<sub>2</sub> refers to the stream of thoughts, feelings and sensations that occur for a person, some of which are more directly the focus of attention than others. It is subjective consciousness<sub>2</sub> that is most often identified as consciousness (Barušs 1990). The problem, of course, is that a person’s experiences as such are private and inaccessible to the members of a scientific community. Behavioural consciousness<sub>2</sub> is the operationalization of subjective consciousness<sub>2</sub> so as to make it available for objective study. Conversely, having identified objective criteria for consciousness, one could infer subjective consciousness<sub>2</sub> from the presence of behavioural consciousness<sub>2</sub>. In practice this applies to machines, whereby one would maintain that a machine that can pass the Turing test, that is to say, a machine behaviourally indistinguishable from a human with regard to its information-processing capabilities, is conscious. While this is clearly a logical error, some researchers have insisted that subjective consciousness<sub>2</sub> must be inferred from the presence of behavioural consciousness<sub>2</sub> (e.g., Lycan 1987).

There are those who have maintained that consciousness is more fundamental than indicated in the first three referents. That it is not that consciousness is the subjective stream of experience but that it is the sense of existence that allows for the possibility of there being a subjective stream at all. Usually this is accompanied by the contentions that there is a self for whom experience occurs and that states of pure consciousness without objects are possible. Thus, consciousness<sub>3</sub> is the sense of existence of the subject of mental acts. This is a definition given in subjective terms with no operational equivalent although it has sometimes been reified as an instance of subjective consciousness<sub>2</sub> (e.g., Natsoulas 1986).

### 4 Consciousness Surveys

It does not take long for someone interested in consciousness to notice the disparity of ideas about consciousness in the academic literature. These ideas appear to follow the beliefs of individual investigators, in particular, their fundamental beliefs along the material-transcendent dimension that underlies Western culture (Barušs 1990, 1992). In order to empirically test this contention, Robert Moore and I developed, through a number of stages, an instrument that could be used for measuring beliefs about consciousness and reality (Barušs 1990, Barušs & Moore 1989, 1992).

In an initial study in 1986, we circulated a consciousness questionnaire to academics and professionals chosen on

the basis of the likelihood that someone from their discipline would write about consciousness in the academic literature (Barušs 1990). We received 334 completed copies of the questionnaire. The participants had a mean age of 44 years, 27% were women, 67% had obtained a doctorate, 42% were allied with psychology, 12% with physics, 6% with philosophy, while smaller numbers represented a variety of other disciplines (Barušs & Moore 1992). A material-transcendent dimension clearly emerged with items about reality and consciousness intertwined with one another.

The material pole of this dimension is characterized by agreement with statements that reality is physical in nature and that science is the proper way in which to know it. Consciousness is thought to emerge from neural activity or information processing, to always be about something, and is defined as consciousness<sub>1</sub> or behavioural consciousness<sub>2</sub>. A conservatively transcendent position is defined by importance placed on meaning in life and adherence to traditional religious beliefs. Subjective aspects of consciousness are emphasized with subjective consciousness<sub>2</sub> and consciousness<sub>3</sub> as preferred definitions. Not surprisingly, consciousness is perceived to give meaning to life and to provide evidence of a spiritual reality. At the transcendent pole is an extraordinarily transcendent position whereby not only is the ontological hegemony of physical reality questioned but relegated to the status of a byproduct of consciousness. Respondents tending toward this position were more likely to claim to have had anomalous experiences such as out-of-body experiences, to believe in paranormal phenomena such as extrasensory perception and the continuation of life after death, and to find value in inner exploration. Universal consciousness is the goal of self-transformation as well as the key that makes the process of change possible. Rather than definitions that apply to the waking state of consciousness, altered states of consciousness are emphasized (Barušs 1990, 1992; Barušs & Moore 1989, 1992).

Using a more recent version of the initial instrument, called the Beliefs About Consciousness and Reality Questionnaire, a consciousness survey was conducted of participants at the scientific meeting *Toward a Science of Consciousness 1996 'Tucson II'*. Two hundred and twelve completed questionnaires were received of which 29% were from women and 56% from those who had earned a doctorate. The mean age of respondents was 50. A broad range of disciplinary categories from the natural sciences to arts and humanities was represented. The overall score of 18.3 on the global Transcendentalism scale was higher than that of 1.2 for the 1986 sample with a range of possible scores from 114 to 114. This may be due to a younger cohort for the 1996 study or to more transcendent beliefs of researchers with an actual rather than possible interest in consciousness. Those with an interest in neural correlates of consciousness tended to have low scores while those with an interest in

phenomenology and culture had high scores. Thus the domains of discourse concerning consciousness are dominated by particular beliefs. Physiological aspects of consciousness are likely to be discussed by materialists while experiential aspects by transcendentalists (Barušs & Moore 1998).

While it is often thought that science should proceed without interference from the biases of the scientists carrying out the research, such is clearly not the case for consciousness studies. In particular, an investigator's contention that she has had anomalous experiences such as mystical or out-of-body experiences appears to incline her toward a transcendent position with its attendant emphasis on the primacy of consciousness. This dependence is not surprising given that the study of consciousness is concerned with subjective experiences that are accessible as such only to each investigator for herself (Barušs 1990, 1992, 1996).

## 5 Changes in Students' Beliefs

Given the importance of beliefs about consciousness and reality for the study of consciousness, a question arises concerning the conditions under which a person's beliefs about consciousness and reality would change. One situation in which they could change may be a university course in which transcendental issues are explicitly addressed as part of the course curriculum. Such a situation was presented in some of the classes taught by the author. Students' spontaneous comments concerning the courses had indicated that, in some cases, their beliefs had changed. Hence, in a continuation of our earlier research, Robert Moore and I decided to document those changes. It was hypothesized that students' beliefs would move in the direction of their instructors' beliefs.

For the 1995-96 and 1996-97 school years, students in my undergraduate Humanistic Psychology and Consciousness courses, taught at a small, Canadian, liberal arts, Catholic college, were given the Beliefs About Consciousness and Reality Questionnaire at the beginning of classes in September, around the time of the mid-year examination in December and again around the time of the final examination in April. Students in these classes were presented with data challenging materialist assumptions about the nature of reality and were required to understand the substance of transcendentalist arguments. Also during 1995-96 students in a Psychology of Creativity class taught by another instructor at the same institution and students in an Introductory Psychology course taught by yet another instructor at a separate but comparable small, Canadian, liberal arts, Catholic university were also administered the questionnaire using the same schedule. In addition, during the 1996-97 school year, students in my undergraduate Statistics for Psychology course were included in the study in the same manner as the others. In all cases, students were assured that their responses to the questionnaire would not be observed until all grades for

the course had been submitted.

Analysis of the reliability of the Transcendentalism scale of the Beliefs About Consciousness and Reality Questionnaire using all of the student data gives values for Cronbach's alpha of .88 ( $n = 220$ ), .89 ( $n = 145$ ) and .92 ( $n = 141$ ) for each of the consecutive administrations. Thus, the instrument has good reliability when administered to students. Changes in students' beliefs between the initial and final administrations of the questionnaire for students who completed it on both of those occasions are given in Table 1.

Clearly there are many influences on a students' beliefs of which an instructor's beliefs in a single course are only one possibility. The data indicate that there may be an institutional effect of moving students toward transcendent beliefs irrespective of the beliefs of single individual instructors at the particular college at which I and the Psychology of Creativity instructor teach. The effect was not observed at the university at which the Introductory Psychology course was taught. Alternatively, since the effect was only observed for courses that I teach it may be that I have an effect on students' beliefs without explicit discussion of transcendental issues that overrides other influences on

Table 1

*Within Subjects Analysis of Variance for Changes in Students' Scores on Transcendentalism Scale of Beliefs About Consciousness and Reality Questionnaire*

Class	Years	N	Initial		Final		F
			M	SD	M	SD	
Humanistic & Consciousness	1995-96 & 1996-97	41	31.10	32.06	45.72	33.60	21.19*
Statistics	1996-97	24	24.25	21.66	33.96	24.31	24.01*
Instructor	1995-96	1	74.00		81.00		
Introductory	1995-96	57	13.51	18.65	14.16	19.15	0.13
Instructor	1995-96	1	45.00		43.50		
Creativity	1995-96	7	35.50	14.69	43.93	21.56	1.45
Instructor	1995-96	1	20.50		23.50		

\*significance level  $p < .0005$ .

*n* refers to the number of participants

*M* refers to the mean score on the Transcendentalism Scale

*SD* refers to the standard deviation

*F* refers to the F test statistic for within subjects analysis of variance

While high to begin with, as expected, students' scores in my Humanistic Psychology and Consciousness classes moved in the transcendent direction during the school year. Students' scores in the Introductory Psychology course remained the same despite the fact that the instructor's scores were numerically higher than the class mean. Students' scores in the Psychology of Creativity class increased numerically although not to a statistically significant degree, despite class means numerically higher than the instructor's scores. Surprisingly, students' scores in my Statistics for Psychology course also moved in the transcendent direction even though there was no explicit discussion of transcendental issues in that class.

students. In either case, what the data reveal is that beliefs about consciousness and reality can change during an undergraduate course, at least as measured by the Beliefs About Consciousness and Reality Questionnaire and that more research is needed to understand the reasons for the changes that occur.

This research has implications for the study of consciousness. What one talks about, what definitions one is willing to adopt and what attributes consciousness may have are tied to beliefs about consciousness and reality of the investigators doing the talking. In addition to anomalous experiences, education may influence the beliefs of investigators and hence appears to play a significant role in contemporary consciousness studies. Those entrained in materialist interpretations of reality

and those exposed to transcendentalist arguments may reflect the respective biases of their instructors in their research. This is an issue of fundamental importance for the study of consciousness.

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