

Beyond The Brain: How Body and Environment Shape Animal and Human Minds – Book Review

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Barrett's book provides an engaging overview of the rapidly evolving field of embodied, embedded cognition, which suggests human and animal behaviour does not necessarily originate from representational processes within the brain. Instead, an organism's behaviour relies on the mutuality between their body and the environment.

One of the most important points made by Barrett in this book is that cognition is not a detached brain process, separate from the environment. Currently, the brain is studied in isolation, but Barrett insists that this is due to a common boundary misconception. Researchers currently separate perceptual processes from cognition and view the body as a boundary separate from the environment. However, due to the reciprocal and interactive relationship between the brain, the body and the environment, Barrett suggests that perception and action should not be studied separately. Barrett makes a strong case for the fact that organisms do not create replica, representational worlds inside their brains and that existing models and explanations of behaviour are overcomplicated. The evidence that Barrett presents for this is varied and compelling, with examples from the animal kingdom, motor neurone research, everyday examples whereby humans off-load cognition into the environment and a re-evaluation of Turing's research. According to Barrett, cognition is not exclusive to the brain, but is embodied within an organism's body, within their actions and embedded within the change-able, dynamic environments that they navigate. As organisms are inseparable from their environments, it is this interaction which produces behaviour. In order to understand this, Barrett recommends that the reader reconsiders their current views of cognition.

Humans have one of the largest brains in the animal kingdom and it is widely assumed that human behaviour is caused by complex, computational brain processes. However, Barrett explains that this is not necessarily the case. There is also a tendency for humans to apply this premise to animals, which is misleading as animals have different bodies to humans, live in different environments and are not bound by the same social and cultural implications. To support this, Barrett provides comprehensive examples of organisms and robots with basic internal structures that depict advanced behavioural complexity. For instance, purpose-built robots with powerful central processors show poorer behavioural flexibility compared to robots that have small processors, but have perceptual sensors that allow them to act based on their environment. Barrett dedicates a chapter of this book to the Portia hunting spider, whose behaviour is often described as representationally-dependent. It is commonly thought that these spiders hold concepts in their minds about their world and plan their hunting routes accordingly. However, Barrett argues that complex behaviours, such as mimicry, stalking or smokescreen techniques are context-dependent and could actually use very little brain power. This behaviour could instead be explained in terms of powerful perceptual skills and a few simple rules. Importantly, Barrett explains that, as researchers attempt to explain behaviour in terms of brain functioning alone, they overlook the active role of the organism's body and the environment in influencing behaviour.

In order to illustrate how the body and the environment could shape cognition and behaviour, Barrett provides a useful review of James J. Gibson's theory of direct perception. A main premise of Gibson's theory is the idea that organisms actively use their perceptual systems to directly detect information from their environment. The brain's role in this process is to orientate the perceptual systems for detecting information and behaviour is then produced as organisms exploit environmental features in order to act on the world. This idea contradicts the dominantly-held view that perception is indirect and organisms are passive receivers of information. A main component of Gibson's theory, the

affordance construct, represents opportunities for action, based on environmental properties viewed in relation to an individual. Barrett explains that this theory suggests behaviour is adaptive, as an organism can actively improve the type of information perceived, as they are aware of their own capabilities, physical build and environment and can then take advantage of this available information. More importantly, humans design their environments to offer them the right affordances, or possibilities for action. Therefore, Barrett explains that behavioural variance may be due to the different types of affordances offered to organisms with different bodies within different environments and this may provide a new perspective into individual differences in behaviour.

Barrett's case for the inclusion of the body and the environment in the study of cognition is compelling. Barrett explains that, while internal representations and concepts may be required, researchers must reverse their usual way of thinking and consider behaviour as a bidirectional process, not a linear relationship between stimulus and response. Instead, behavioural processes may involve controlling perceptual systems and feedback, with reciprocation between external and internal processes. Barrett frequently draws upon the work of Andy Clark and his notion of the extended mind. This theory suggests that common misconceptions about where action starts and perception ends have led psychologists to focus on what is in the head alone when investigating behaviour. Instead, the mind, body and the environment could act as one complex, non-linear cognitive system. Throughout the book, Barrett provides rich examples to support the premise that the environment is actively involved in cognitive processes and that perception and action are not separate. This evidence includes traditional examples from mirror neuron research, whereby a neuron in the motor cortex fires both when an organism acts and when the organism views the same action being performed by another. Other evidence includes environmental props used every day by humans, including diaries, calendars and calculators which support cognitive functioning. Barrett makes a refreshing contribution to this area of research by including evidence from the animal kingdom, which is both comprehensive and persuasive. Each of these examples suggests that cognition is embodied and embedded and extends to our environments and the objects within it.

This book is the perfect synthesis of research for those interested in an embodied, embedded approach to cognition and comes highly recommended. Compared to other books in this area the breadth that this book covers in such a short time is remarkable. Barrett expertly integrates areas of evolutionary biology, anthropology, artificial intelligence, psychology and philosophy in order to explore cognition and behaviour as arising from the interaction between the brain, body and environment. Barrett lets the evidence speak for itself and introduces key theories in a timely and coherent manner in order to invite readers to challenge the existing assumptions that they hold about the world. Barrett's writing style is unique, relatable and academic, a style that is accessible to both professors and non-academics. Not only does this book have broader implications for how behaviour is studied, but for the entire field of psychology, as the study of cognition begins to become more embodied and embedded.

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