

24.2 Mind and brain Building bridges between neuro

24.2 Mind and brain: Building bridges between neurology, psychiatry, and psychology 5778 Adam Zeman

'The great regions of the mind correspond to the great regions of the brain' Paul Broca ' . . . the master unsolved problem of biology: how the hundred million nerve cells of the brain work together to create consciousness . . . ' E. O. Wilson. Consilience, 1998

ESSENTIALS Medicine is traditionally regarded as concerning itself with disorders of the body while psychiatry concerns itself with disorders of the mind—and 'never the twain shall meet'. But both everyday clinical experience and our growing understanding of the physical basis of mind challenge this view. Patients are always a compound of body and mind; discoveries relating to the mechanisms, phylogeny, ontogeny, and functions of the central nervous system are gradually traversing the mind-body and mind-brain divides. We should take a bio-psycho-social approach in every clinical encounter and seek theories that explain the emergence of mind from life much as life emerges from matter.

Introduction Here is one view of the relationship between medicine and psychiatry: physicians study, diagnose, and treat disorders of the body. Psychiatrists, by contrast, study, diagnose, and treat disorders of the mind. Medicine is concerned mainly with processes in objects—like the circulation of the kidney; psychiatrists concern themselves mainly with the experiences of subjects—like auditory hallucinations. Medical disorders are 'organic', psychiatric disorders are 'functional'. Medicine is mainly a science, psychiatry mainly an art. The brain, on this view, occupies an ambiguous position, poised between body and mind: it is an ambiguous intermediary, a skilful interpreter between the

languages of mind and body. Nevertheless, disorders of body and mind can and should be rigorously distinguished. This chapter will examine, and question, these assumptions. They are not universally held but they are widespread and tenacious. They have some practical importance, influencing the way that doctors approach patients and train students, and they underpin a deep theoretical problem in biology, the puzzling relationship between body and mind. A century of research on the biological basis of cognition, mood, personality, and behaviour, and much recent writing in philosophy, points to the need to rethink these time-honoured beliefs. What is the mind? 'Mind' is not a scientific term and has no strict technical definition. We use it to refer, broadly, to the capacities that enable our cognition, mood, motivation, personality, and behaviour. 'Cognition' in turn, a word derived from the Latin 'cognoscere', to know, refers to our intellectual capacities: very broadly these allow us to gain and store knowledge of the world, including one another, and to use it to guide our actions. Cognition is currently subclassified into attention, memory, executive function (the ability to organize thought and behaviour), language, perception, and praxis (our capacity for skilled action). Cognition is closely related to—but not identical with—the other aspects of mind: mood and motivation are self-explanatory; personality refers to the more or less enduring traits that characterize our conduct of our lives and our approach to other people; behaviour is included among the elements of mind to allow for instances—like temper tantrums—in which the outward manifestations of mental processes are their most striking feature. It is worth noting, in passing, that because the term 'mind' is colloquial rather than technical, and because its workings are of great interest and importance to most of us, we tend to have preconceptions about its nature. These are strongly influenced by our religious and cultural backgrounds. There is, for example, a powerful human tendency, apparent across cultures and historical time, to believe that the mind can be prised apart from the body and survive its death. Whatever our own attitudes to these beliefs, they continue to exert a widespread influence.

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24.2 Mind and brain 5779 What is consciousness? Another complex capacity, consciousness, closely linked to mind, has attracted enormous interest over the past 30 years. The term 'consciousness' can be used to refer both to a state of arousal—wakefulness, for example, as opposed to sleep or coma—and to the contents of our awareness—for instance, 'what it is like' to be sitting and reading these words. Recent advances have allowed neuroscientists to investigate the physical basis of experiences like this, taking due account both of the rich texture of our awareness and the immense subtlety of the related processes occurring in the brain. The advances that have made this possible include the development of functional brain imaging techniques, which are constantly revealing exquisite correlations between features of experience and events in the brain; and discoveries in psychology showing that only a part of what happens in the brain ever reaches awareness, underwriting the concept of unconscious processes. But the fundamental explanation for the current, widespread, fascination with consciousness is that its science holds out the promise of healing the ancient rift between brain and mind. The biology of conscious and unconscious mind Mechanism The maintenance of wakefulness depends upon the integrity of a complex activating system located in the upper brain stem, thalamus, hypothalamus, and basal forebrain which projects widely throughout the cerebral hemispheres to regulate conscious states. These are reflected in the rhythms of the brain's electrical activity recorded from the scalp—the electroencephalogram (EEG). The contents of awareness, by contrast, depend upon the transient activation of widespread 'neuronal assemblies', interconnected groups of neurons distributed among cortical and subcortical regions. The recent discovery of the brain's

'resting state networks' highlights the underlying organization that gives rise to these transient assemblies. At any given moment, much of the potentially conscious activity in the brain occurs unconsciously—you were probably not aware, before reading this, of the tension in your left elbow. What distinguishes the neural activity of which we are aware? There are several candidates with some empirical support for each: the quantity of neural activity, related to its amplitude and duration; its quality, for example, the degree of synchronization among participating neurons; its location in the brain, for example, whether it is predominantly cortical or subcortical; its connectivity, for example, whether activity in early sensory areas does or does not propagate to cortical areas downstream. The two current leading theories of awareness, the global workspace model, and the integrated information approach, both emphasize the last of these four parameters. They propose that the distinctive feature of the neural activity 'in consciousness' is that it is both processed locally and communicated widely throughout the brain, gaining access, in particular, to the neural resources that control action and allow report. These theories are beginning to bear practical fruit, as in the recent development of a 'perturbation complexity index', which captures the complexity of conscious state and content in a single informative value.

Phylogeny—evolution of the mind The elements of the nervous system—the neuron, its ion channels, and its chemical transmitters—date back to the origins of multicellular life. In almost every complex organism these common elements have been exploited to create a signalling system that enables animals to respond to events around them with appropriate actions, the earliest embodiment of mind. Some animals have invested heavily in this system, allowing a progressively richer range of perceptual distinctions and a more flexible repertoire of response. This process of 'encephalization' has been particularly striking in parts of the vertebrate lineage, including our own primate line. The rapid growth of the brain, out of proportion to change in body size, has been the most striking feature of the past five million years of hominid evolution. It occurred in parallel with—probably both drove and was driven by—the emergence of technology, language, and culture, with the implication that the most distinctive features of the human mind are integral to our biology.

Ontogeny—individual development of mind 'Follow a child from its birth, and observe the alterations that time makes, and you shall find, as the mind by the senses comes to be more and more furnished with ideas, it comes to be more and more awake', wrote the philosopher John Locke 300 years ago. Our capacity to learn, the prerequisite for the process Locke describes, is now thought to depend upon the plasticity of synapses: these are shaped by experience, which strengthens some and weakens others, creating neural assemblies that represent regularities in the world around us and in our behaviour. There is no shortage of material for this process: the human brain contains of the order of 10^{11} neurons, each receiving up to many thousands of synapses. The development of a human mind has another crucial dimension. The acquisition of a 'theory of mind' between the ages of around two and five—the realization that we ourselves and those around us gain knowledge of the world from a fallible, limited, perspective, and are therefore liable to false belief—may be the most distinctively human intellectual achievement.

Function What is the biological purpose of the mind? Simple nervous systems are networks of communication and control, designed to ensure that the organism responds to events in the environment with appropriate actions. Complex nervous systems elaborate these processes, but the tailoring of behaviour to circumstance remains the fundamental function of the mind. The mind-brain problem

How then are mind and brain related? The relationship is clearly intimate, but also puzzling. Traditionally, physicalism claims that what passes through our mind is identical with what happens in our brains; behaviourism asserts that statements about mental events can be reduced to statements about behaviour; functionalism suggests that mental processes can be understood in

terms of transformations of sensory inputs into motor outputs. The puzzle that troubles some thinkers about mind and brain is that, seemingly, one could know everything about an organism's neural processes, behaviour,

SECTION 24 Neurological disorders 5780 and functional design, and yet be ignorant about what it is like to be that creature. This inspires alternative 'dualistic' accounts of mind and brain, which posit an essential difference between mental and physical, subjective and objective, entities or properties. But these dualistic theories, in turn, get into difficulty when they try to explain the undoubted interactions between mind and brain. This ancient dilemma remains unresolved: it seems likely that the solution will involve some changes in our understanding of the nature of both matter and mind.

A practical solution: A bio-psycho-social approach

The mind-brain problem impinges on clinical practice. As every practising doctor knows, interactions between mind, brain, and body are constantly on view. Here are some examples: (1) medical problems usually come to light by way of a complex set of intervening psychological processes that occur when someone notices, ponders and decides to present with a physical symptom; (2) psychological upset can manifest itself in physical symptoms, as for example in a panic attack or a somatoform disorder; (3) physical diseases commonly cause secondary psychological reactions, such as anxiety and depression; (4) physical disease affecting the brain often gives rise directly to psychological manifestations, for example, memory loss.

Given that the physical and mental are both constantly on show in the everyday practice of medicine, there is much to recommend taking a 'bio-psycho-social' approach to every patient. This acknowledges that people can't be divided into 'organic' and 'functional' groups: we are all compounded of body and mind. In every clinical encounter—whether in general practice, cardiology, neurology, or psychiatry—we should aim to define its biological, psychological, and social dimensions.

A theoretical solution: Matter, life, and mind

In the 19th century many thinkers believed that 'life' was an irreducible phenomenon, the manifestation of an 'élan vital'. The biochemical discoveries of the 20th century revealed that life simply is the set of processes that allow organisms to utilize energy from their surroundings to reproduce themselves—and thereby made it clear how matter could give rise to life. It seems natural to ask whether mind might be explained in terms of the intelligent activities of living things, just as life has been explained in terms of the workings of organized matter. Is this a plausible ambition? As we have seen, attempts to 'conjure' mind from brain can be met with puzzlement: there seems to be no possibility of understanding how the 'water of the brain' gives rise to the 'wine of experience'. But arguably the problem we run into here results from narrowing the frame of explanation too severely. Mind is not a mysterious emanation from the brain—it is always the activity of a human being: an activity rooted in a brain and body; the product of a long, largely forgotten history of development; embedded in the context of a human culture; and usually engaged in interaction with its physical surroundings. The brain is not a magic lamp from which we conjure the genie of mind: it is instead a great enabler, a subtle instrument enabling us to apprehend, and engage with, the rich complexities of our social and physical environment.

Conclusion

Given what science and philosophy reveal about the nature of the mind, here is an alternative view of the relationship between medicine and psychiatry: physicians and psychiatrists study, diagnose, and treat illnesses. These are physical processes linked to human experiences, the outcome of disorders of structure or function occurring in organisms. Some, medical disorders, are more easily identified or understood at the level of bodily process, others, psychiatric disorders, at the level of subjective experience, but this distinction is extremely fluid, especially so in clinical neurology. Medicine must always draw on science, to understand the physical basis of disorders, and art, to appreciate the individual human complexities of the

resulting predicaments. All our disorders affect our bodies and our minds. FURTHER READING
Butler C, Zeman A (2005). Neurological syndromes which can be mistaken for psychiatric conditions. *J Neurol Neurosurg Psychiatry*, 76(Suppl 1), i31-8. Cummings JL, Mega MS (2003). *Neuropsychiatry and behavioural neuroscience*. Oxford University Press, Oxford. David AS, et al. (eds) (2009). *Lishman's organic psychiatry: a textbook of neuropsychiatry*, 4th edition. Wiley-Blackwell, Chichester. Gazzaniga MS, et al. (2013). *Cognitive neuroscience: the biology of the mind*, 4th edition. W.W. Norton & Company Ltd, New York, NY. Laureys S, Gosseries O, Tononi G (2016). *The neurology of consciousness*, 2nd edition. Academic Press, San Diego, CA. Zeman A (2002). *Consciousness: a user's guide*. Yale University Press, New Haven, CT. Zeman A (2014). Neurology is psychiatry and vice versa. *Pract Neurol*, 14, 136-44.

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